the OIL AND GAS JOURNAL

SEPTEMBER 8, 1958

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CURRENT STATISTICS p. 161

How Gas Is Moving in on Oil p. 63

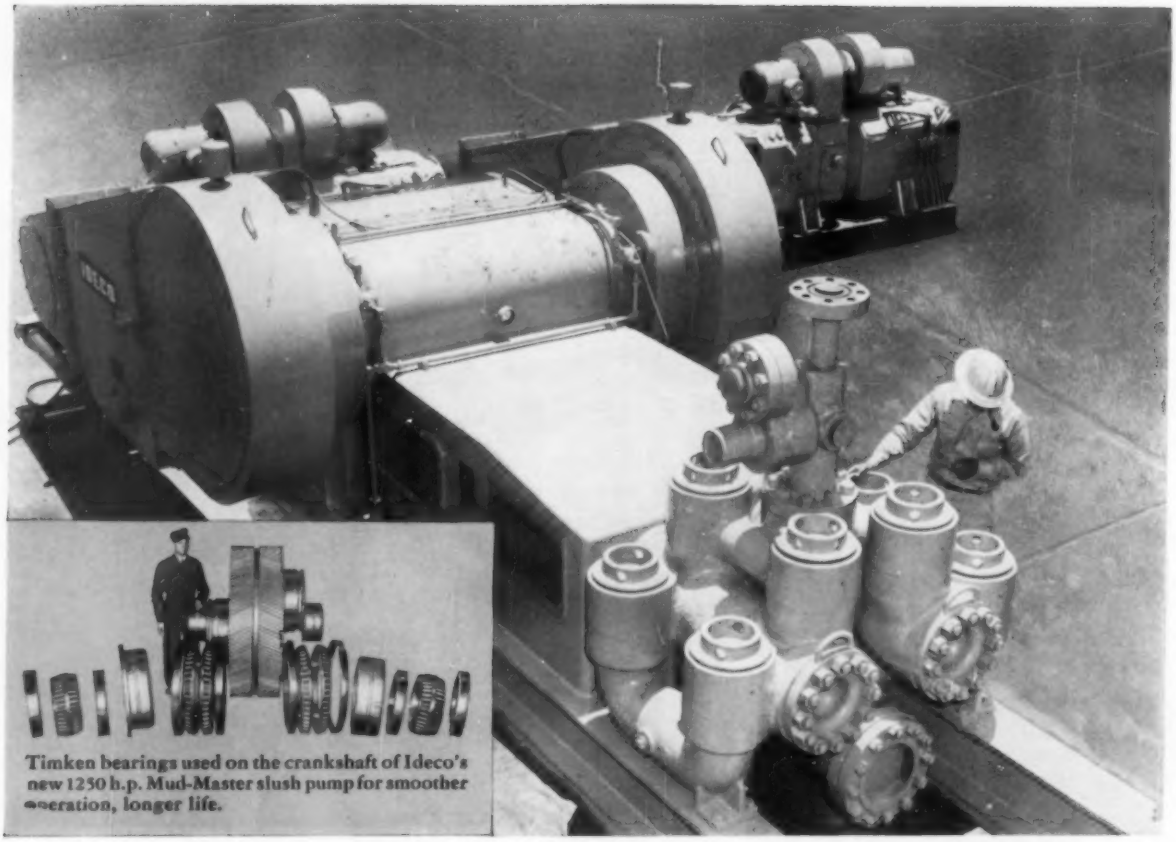
Alkylation Boom Has Just Started p. 70

New Tool Speeds Monitoring p. 96

AUTOMATION PAYS OFF . . . p. 113

At Union's new pipeline terminal

ONE DOLLAR PER COPY



Timken bearings used on the crankshaft of Ideco's new 1250 h.p. Mud-Master slush pump for smoother operation, longer life.

New pump meets any mud circulation problem with TIMKEN® bearings for longer life and minimum maintenance

THIS new 1250 h.p. Mud-Master slush pump built by Ideco meets the increasingly heavy hydraulic requirements of deep oil well drilling. Because it's designed for sustained trouble-free operation under highest pressure conditions, Ideco engineers equipped its entire crankshaft assembly with Timken® tapered roller bearings.

Makers and users of rugged oil-well equipment specify Timken bearings because they provide long life with minimum maintenance. Because of their tapered construction, Timken bearings take both *radial and thrust loads,* or any combination. And full line contact between rollers and races gives them load-carrying capacity to spare. They hold the crankshaft in rigid alignment, minimize deflection and end-play that wear down related parts. And Timken bearings take shock loads, too. They're case-carburized for hard, wear-resistant surfaces over tough, shock-resistant cores.

To get all these advantages for the machinery you buy or build, specify Timken tapered roller bearings. Always look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

TIMKEN TAPERED ROLLER BEARINGS ROLL THE LOAD

TRADE-MARK REG. U. S. PAT. OFF.

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Sept. 8, 1958

Move by refiners to cut runs, shift yields is good omen:

Number of refiners and volumes involved so far aren't large, but the trend is growing and should spread throughout the industry.

If so, the twin moves should prevent a price collapse in the gasoline market this winter and forestall a possible shortage of heating oils when cold weather comes.

Marketers say privately they're cheered that refiners appear to be gearing their operations more closely to market conditions. Right now this is the market picture:

...Gasoline is soft. Labor Day marked end of big motoring season. Heavy demand for this money product won't return until spring. Refiners, meanwhile, are starting the off season with about 2 million more barrels of gasoline in storage than last year. This will depress prices unless the oversupply is prevented from growing.

...Heating-oil prices are untested. They advanced a few weeks ago, but marketers are having trouble maintaining the higher level because demand just hasn't started yet. Some good cold weather in the north and east would put snap into this market.

For producers, these market conditions should be a warning not to pressure for a return to heavy crude production.

▼ ▼ ▼

Effect of NATURAL GAS on petroleum markets is shown more clearly in latest statistics. They reveal that:

...Gas consumption has risen so fast since the war that it now equals 55% of demand for petroleum products.

...Heating oils are chief victim. These distillates have gained in volume, but their percentage of the market has remained static in the last few years and never has regained prewar levels.

Result has been this: Gas growth has tended to depress distillate and residual prices, which have proved a drag on a rise for crude prices. This depressing effect is more stifling because gas prices are under federal control (p. 63).

▼ ▼ ▼

Reports that Gulf is buying up Union Oil's refining facilities on the West Coast have been denied.

Union Board Chairman Reese H. Taylor said flatly:
"We are not negotiating with Gulf or anyone else concerning sales of our facilities."

Rumor touched off a burst of activity in Union's stock recently and probably stems from a 1956 financial deal. At that time Union sold $120 million worth of 3¼%, 25-year convertible debentures to Gulf and signed a crude purchase pact with Gulf involving foreign production.

The debentures are convertible at $70 for 5 years and thereafter at a higher price, which doesn't make conversion attractive at current Union prices. If Gulf should convert, it would be Union's largest stockholder with 22% of the outstanding common.

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Signs of the times: Indiana Standard's capital spending this year will total $330 million, $140 million less than earlier estimates.

Biggest cut in budget estimates was $94-million reduction in exploration and drilling.

Company is proposing $200-million debenture offering to pay off bank loan and finance the capital improvements.

Sharp drop in 1958 auto sales now is laid to recession with its resulting drop in employment and incomes and to style preferences of significant number of potential buyers.

National Industrial Conference Board reports net growth in auto market is depending more and more on increases in the number of two-car families. These often prefer small, foreign cars which now account for more than 7% of the market.

▼ ▼ ▼

EXPLORATION men are watching with interest the hot wildcat play shaping up in northwest Kansas (p. 145).

Eleven wildcats currently are drilling in the area centering on the juncture of Cheyenne, Rawlins, Thomas, and Sherman counties.

Well that set off the spree was Phillips I Llanos. Now Phillips has two indicated commercial offsets. The feeling is that possibly two new pay zones and more fields will be turned up by the wildcatting.

A Pennsylvania wildcat success has set up an inviting new gas target for wildcatters (p. 149).

New York State Natural Gas Co.'s third try came in for a good gas producer. It sets up a 90-mile long potential stratigraphic-type producing trend along the southeast flank of the Sabinsville anticline. This extends from central Jefferson County in the southwest to Potter County in the northeast.

Oil and gas exploration is setting a fast pace in Canada. These trends vie for the headlines (p. 154):

...Foothills belt where discoveries have converted this complex area into a major gas province.

...British Columbia gas play which promises to extend into the Northwest Territories.

...Reef play which has been given new impetus by Shell and British American's Berland River operation.

▼ ▼ ▼

Equipment developments:

...New pipeline pig with variable diameter capable of cleaning as many as four different pipe sizes has been developed by Service Pipe Line.

...New turbine-type meter has proved accurate and durable in 3 years of development and testing on major products line. It now is being tested on other lines. Meter has particular application for custody transfer on medium and high-capacity lines. Other advantages: Comparatively low initial cost and low maintenance cost.

...Fluid-flow measuring unit for LACT systems is the first device to measure oil flow by weight instead of volume.

The equipment eliminates errors caused by temperature changes, foaming. Some units already have been shipped to Venezuela for use by Creole Petroleum (p. 66).

...Device for continuous measurement of bottom-hole pressure is now being field tested in a southern California well. It will be on the market soon. Device is run to the bottom on the tubing string and transmits pressure data to the surface without wires. Other details still are being kept under wraps.

▼ ▼ ▼

Three REFINERIES and a petrochemical plant are being operated by Ohio Standard without a labor contract.

Agreements with OCAW have expired at Toledo, Cleveland, and Lima. Negotiations for new ones have bogged down.

Replying to strike threat, Sohio spokesman says company has just started up $40-million Toledo refinery and adds: "We don't intend to shut it down" (p. 80).

Refiners are entering their biggest alkylation expansion period in history (p. 70).

That's the flat prediction in a special study just made by M. W. Kellogg Co.

The survey reveals that by 1964 alkylation capacity will be three times what it is today. Building each year will be greater than the year before and in 1964 alone projects will add more capacity than exists today.

Crude imports fell sharply in July, new reports show.

Nation-wide total was 829,400 bbl. daily compared to 932,200 bbl. daily in June.

Other highlights: Unfinished products imported totaled 138,300 bbl. daily against a May-June average of 167,100 bbl. ...Only 7 of 36 companies reporting exceeded their quotas.

Microchemistry is a comer—it'll play an increasing role among refining and petrochemical researchers.

The reason: Millions stand to be saved annually by substituting microchemistry for pilot plant work. It's estimated the chemical industry will spend $82 million and the oil industry $94 million on pilot-plant research this year.

The new technique offers a chance to study the minute samples of compounds and their reactions. With equipment now available, a mass of design data can be accumulated without spending vast sums on manpower and pilot plants.

Trend in natural-gasoline and cycling plants is toward low molecular-weight absorption oils.

The reason: Same amount of gas can be absorbed with smaller gallonage of oil pumped. The lighter oil is more efficient because it has more molecules per gallon.

Advantage lies in increasing plant capacity simply by changing oil plus conserving both pumping requirements and energy.

▼ ▼ ▼

In OIL ABROAD, keep an eye on rising Red influence in Venezuela. Caracas reports give this picture:

Communists, who organized the anti-Nixon riots, are gaining in influence. They are gaining control of the press. They're in labor unions, civic and student groups, and even in industry. They can call out a mob to back up their demands.

Opposition to the communists at the moment is risky. They helped overthrow Venezuela's dictatorship last January and still carry the mantle of patriots.

Oil operations in Venezuela so far have not been hampered. But if communists do gain real control of the country, there'll be plenty of danger to oil.

Harbinger of peace is seen in Syria's invitation to Tapline to reopen talks on transit fees.

Talks on higher fees started 2 years ago. They've been interrupted repeatedly since by hotter problems.

At that time, Tapline paid Syria about $1.2 million a year to move about 321,000 bbl. daily across a 60-mile section. The line moves Saudi Arabian oil to Lebanese terminal of Sidon.

Throughput capacity since then has been stepped up by additional pumping facilities.

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Good Wells Make Good News

A Monthly Report of Successful Well Treatments

September 8, 1958

Acidizing, as well as fracturing, should be considered when planning a stimulation treatment. Acidizing may actually be the most profitable treatment for your well. Here are four recent examples of successful acidizing jobs by Dowell.

- **Crane County, West Texas.** (New Oil Well) This well was completed in the Silurian-Montoya dolomitic limestone (5110 to 5114 feet). It swabbed only 3 barrels of oil and then went dry. Operator ordered 500 gallons BDA* (Breakdown Acid) to prepare well for fracturing. *After treatment with BDA, well came in 110 bopd flowing—without fracturing.*

- **Southeastern Saskatchewan, Canada.** (Old Oil Well) This was completed in July 1957 in the Charles. Casing was perforated in four intervals between 4476 and 4510 feet. After initial acidizing, production rose to about 60 bopd but gradually decreased to 22 bopd. Dowell was called to treat the well with the retarded acid-action fluid used in Acid Petrofrac*. 5000 gallons fluid and 80 ball sealers were used. Treatment was down casing at 8 bpm. 20 ball sealers were injected after each of the first four 1000-gallon batches of fluid. Four days after treatment, *the well was pumping 55 bopd. The producer figured that the treatment cost of $3295 paid out in only 35 days.*

- **DeSoto Parish, North Louisiana.** (New Gas Well) Completed through perforations (6340 to 6350 feet) in the Pettit limestone, this well made a show, but no production. Dowell was called to acidize. First, 2000 gallons of acid containing demulsifying agent was used. Then 6000 gallons Dowell X Acid was pumped into well at 5.8 bpm, and displaced from tubing with water. *After clean-up well potentialed 52 mmcfd open flow.*

- **Russell County, Kansas.** (New Oil Well) This well was completed in the Kansas City limestone but produced less than 3 bopd. The producer ordered a treatment of 3000 gallons Retarded Acid spearheaded by 250 gallons BDA (Breakdown Acid). *After clean-up following treatment, well tested nearly 2000 bopd.*

Your zone pay may be a relatively insoluble sand or a fast-reacting limestone. In any case, acid may be your best buy. Let your Dowell engineer help you "tailor" an acid treatment for your well. In some cases the acid may be used to remove mud blocks. In others, it may increase the drainage area of the well or improve fracturing results. For service, call any of the 165 Dowell service points and offices. In Canada, contact Dowell of Canada, Ltd.; in Venezuela, contact United Oilwell Service. Or write Dowell, Tulsa 1, Oklahoma.

*Dowell Trademark

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211 South Cheyenne Ave.
Phone Diamond 3-6291

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Phone LOngacre 4-6160

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Phone District 7-1710

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EXPLORATION • DRILLING • PRODUCTION • FIELD PROCESSING

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TECHNOLOGY–OPERATION

Refining-Processing

A New Way to Measure Product in Slack Lines 88

Air space in slack lines can be measured by injecting a known quantity of compressed air and observing the increase in line pressure. Tests of the equipment indicated a maximum error of 9%, but several improvements of the installation have reduced this figure somewhat.

Capacitance Measurement Is Valuable for Process Stream Analysis 96

By F. E. Moore

This tool is proving highly successful in many applications, particularly: (1) Octane-improvement analysis made on catalytic reformers, (2) pipeline-interface detection, and (3) B.s. and w. monitoring of crude-oil streams.

A Comparison of Gas-Purification Processes 100

By Fred Zapffe

The three most popular natural-gas-purification processes are amine, iron sponge, and hot potassium carbonate. Here is a discussion of the outstanding features of each, the comparative economics of each, and the criteria which dictate the process which should be used in a given situation.

A Close Look at Filiform Corrosion 118

By J. D. Sudbury, O. L. Riggs, and J. F. Leterle

This type of corrosion is highly directional and is characterized by the formation of long, narrow, hollow, threadlike filaments of the corrosion product. It is a special form of an oxygen concentration cell. A specially developed inhibitor controls this corrosion as shown by two field tests.

Process Costimating 126

Pipelining

A New Way to Measure Product in Slack Lines 88

Capacitance Measurement Is Valuable for Process Stream Analysis 96

By F. E. Moore

Automation Pays Off at Pipeline Terminal . . 113

By Dean Sandford

Union Oil Co.'s new Oleum terminal on its San Joaquin Valley crude line is monitored by the terminal operator but is actually automatic in operation. Twin receiving manifolds, capacitance analyzers, and pressure controllers are the factors which contribute most strongly to automation of the terminal.

Drilling-Production

Successful Propping of Fractures in Incompetent Formations 92

By J. L. Huitt and B. B. McGlothlin

High overburden pressure will cause an induced fracture to collapse due to crushing of the propping sand grains or to complete embedment of the sand grains in the formation. Here is a method of evaluating a formation to determine if embedment might occur and a way to prevent it.

More and Better Cost Controls for the Drilling Contractor 104

By Walter H. Helmerich III

This is one answer to the currently grim competitive situation in the drilling contracting business. Use of this system of cost control accounting or one similar to it will lead to a better understanding between the contractor and the operator. And it will enable the contractor to reduce his costs at every point possible.

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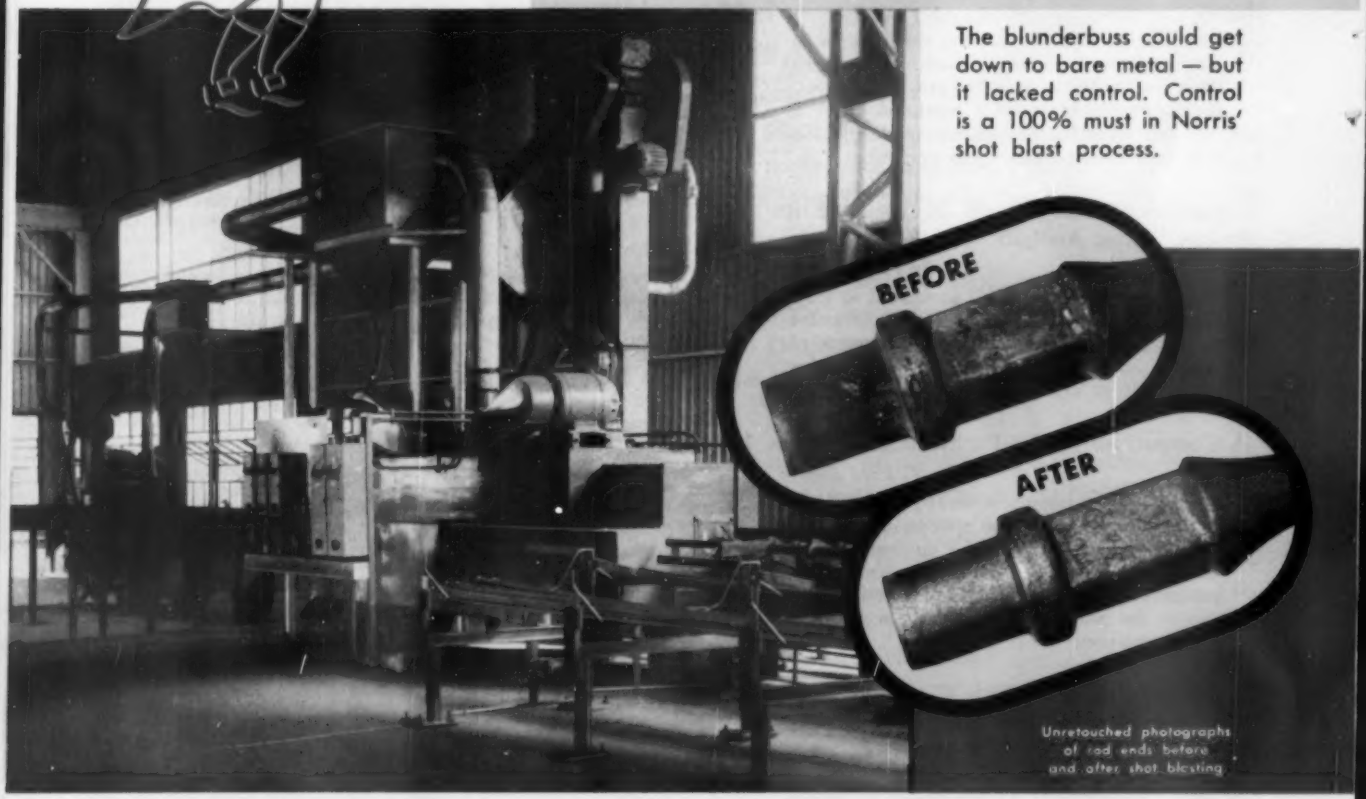
SHOT BLASTING

. . . CLEANS ROD BODY FOR BEST PROTECTIVE COVERING

The blunderbuss could get down to bare metal — but it lacked control. Control is a 100% must in Norris' shot blast process.



Unretouched photographs of rod ends before and after shot blasting

. . . in LARGEST, MOST MODERN SUCKER ROD PLANT in the Oil Industry!

In this latest model Wheelabrator machine, automated in controls, the scale caused by heat-treatment is removed by shot-blast, metal to metal abrasive, at high velocity. Inspection then is further aided, as any defects can be detected more readily.

Clean and smoother metal surface is obtained for a better protective paint finish-coat, for the better care and life of NORRIS Quality Sucker Rods.

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For big fans, blowers, pump drives—heavy duty applications where you need large motors with highly effective cooling systems for long life—choose Wagner Tube Ventilated Motors.

These motors have fabricated steel frames that are provided with a series of tubes through which cooling air is forced by an external blower. Internal blowers, one at each end of the rotor, circulate the warm air inside the motor through ducts in the rotor and stator and around the cooling tubes. This effective cooling system holds the operating temperature of the motor within the specified limits of 55° C Rise for Class A or 75° C for Class B insulated motors.

Wagner tube ventilated motors are available as Type YP, standard TEFC, with Class A or Class B insulation; or as Type ZP, explosion-proof, with Class A insulation only. Type ZP motors can be supplied with Underwriters' Labels for Class I, Group C or D, or for Class II, Group E, F or G locations. Let your Wagner Sales Engineer show you how these motors can solve your big motor problems.

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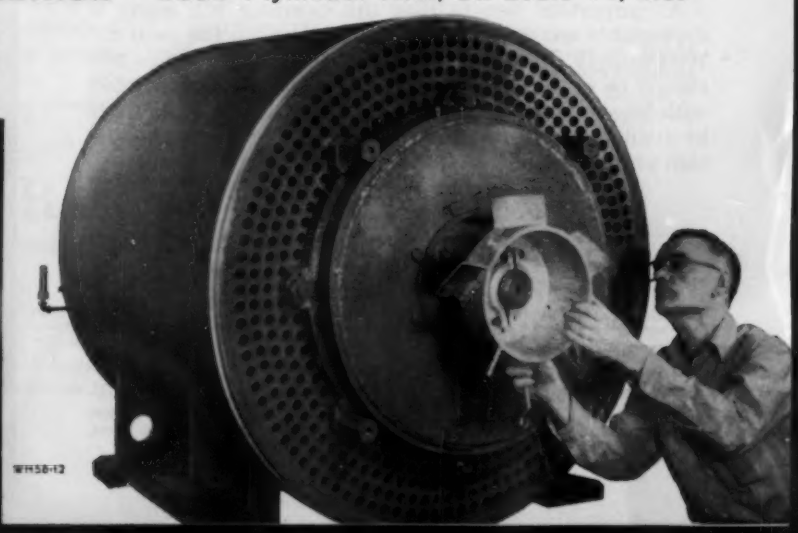
This 400 hp tube ventilated motor is being tested on a 1000 hp dynamometer at the Wagner plant. Photo of motor at right, with blower shield removed, shows cooling tubes and external blower.



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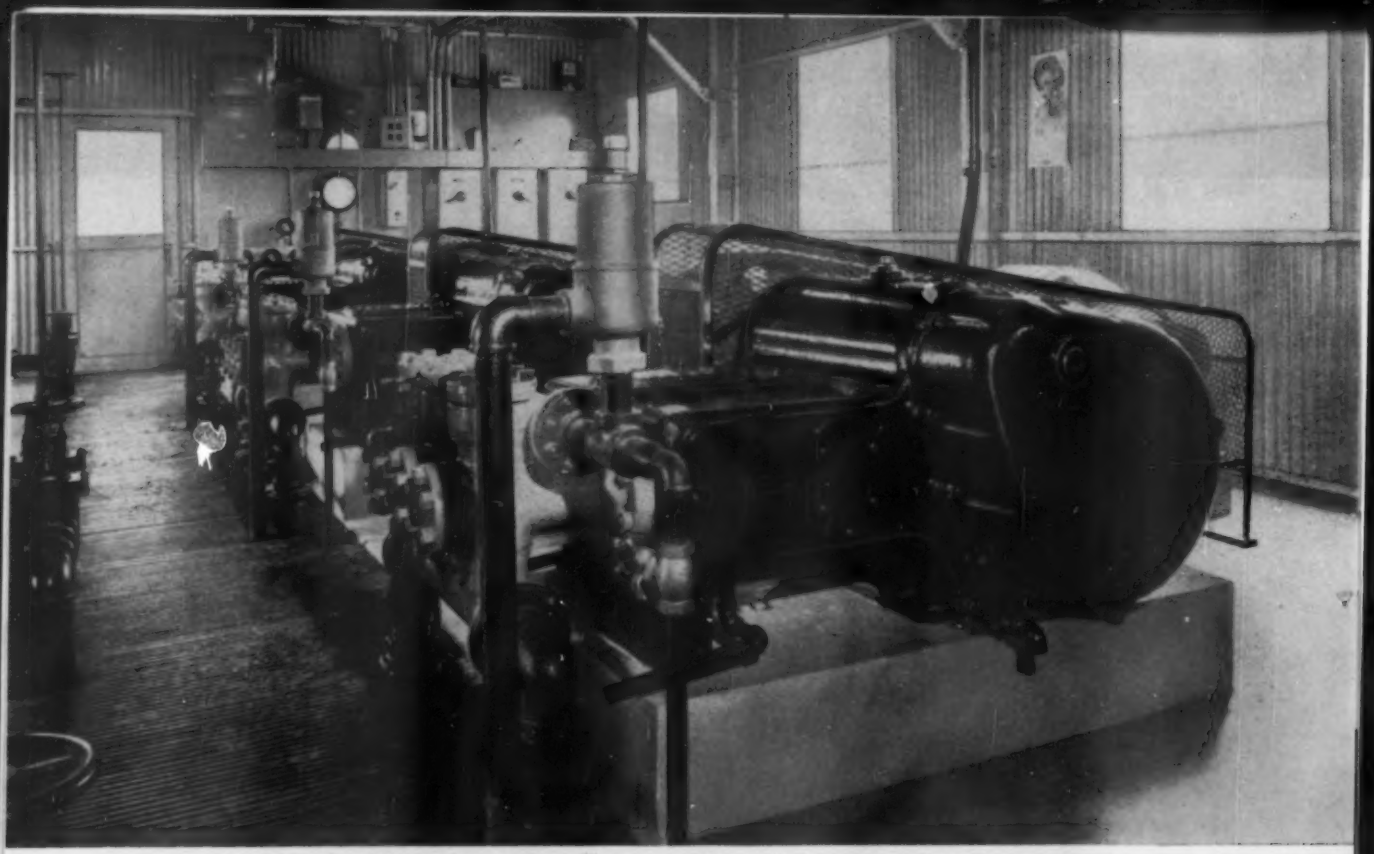

Five "Oilwell" 38-P Triplex Plunger Pumps operate this Lee County, Kentucky, waterflood. A first plant with two pumps was installed some two years ago. The second plant with three pumps (illustrated) was added the following year.

Take the risk out of "put and take" with "Oilwell" Pumps and Pumping Units

AN OIL producer in Kentucky has taken the chance out of these "put and take" operations by installing five "Oilwell" waterflood pumps to **put** water into the wells and 125 "Oilwell" medium-duty pumping units to **take** oil out.

All these units are designed for continuous, rigorous operation with a minimum of attention. Both pumps and pumping units incorporate money- and maintenance-saving features.

An important benefit that this operator will enjoy is dependable service from a single source . . . the local Oil Well Supply Store. Maintenance parts and supplies will always be of the same high quality as originally furnished with this equipment. And "Oilwell" specialists will always be available when needed for consultation on any production problems which may arise.

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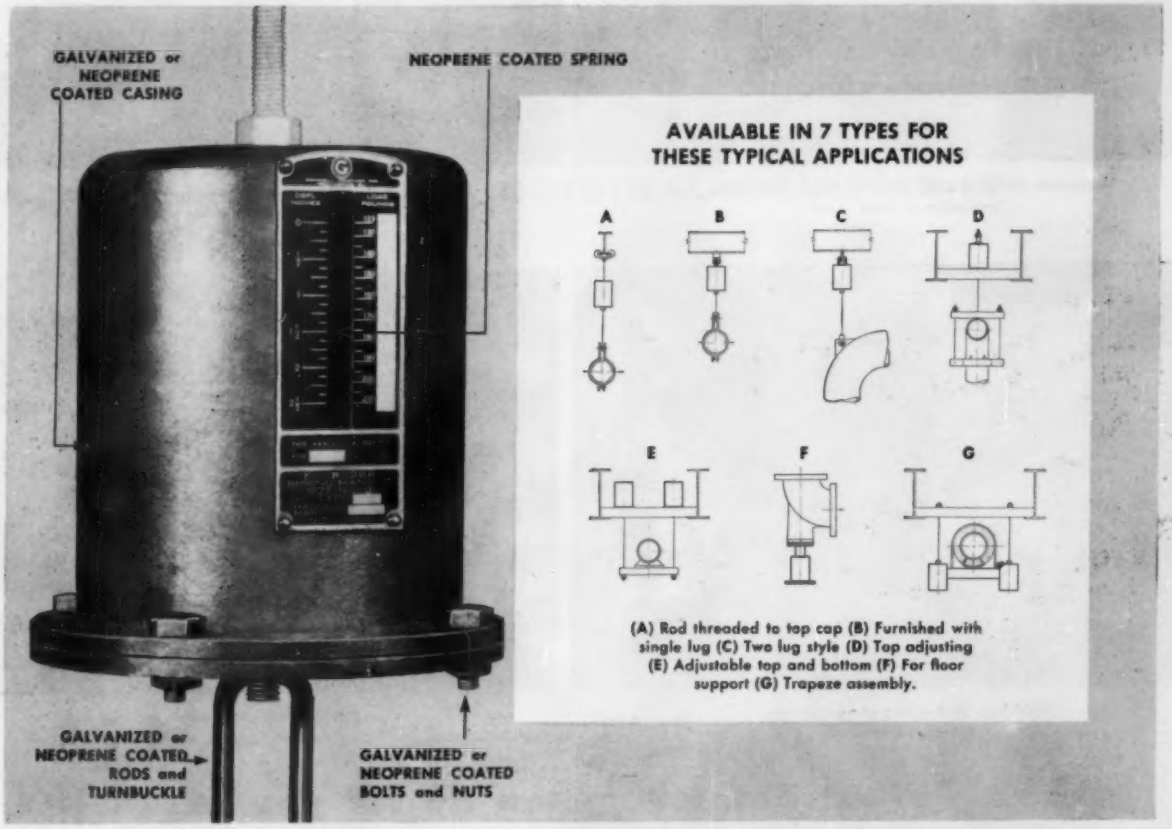
This installation is typical of the electric-powered "Oilwell" 25L3 Pumping Units which are used to take out the oil.

corrosion-resistant, weather-resistant

GRINNELL VARIABLE SPRING HANGERS


GALVANIZED or NEOPRENE COATED CASING
NEOPRENE COATED SPRING
GALVANIZED or NEOPRENE COATED RODS and TURNBUCKLE
GALVANIZED or NEOPRENE COATED BOLTS and NUTS
AVAILABLE IN 7 TYPES FOR THESE TYPICAL APPLICATIONS
A
B
C
D
E
F
G
(A) Rod threaded to top cap (B) Furnished with single lug (C) Two lug style (D) Top adjusting (E) Adjustable top and bottom (F) For floor support (G) Trapeze assembly.

In addition to their proven corrosion and weather resistance, these spring hangers offer other features.

- **Maximum variation in supporting force for standard spring models per ½" of deflection is 10½% of rated capacity — in all sizes.**
- **Precompression (a patented feature) assures operation of spring within its proper working range, as well as saving valuable erection time. Reduced over-all height saves space.**
- **21 sizes available from stock for load ranges from 50 lbs. to 28,200 lbs.**
- **Available in 3 spring lengths for maximum travel of 1¼, 2½, and 5 inches.**
- **Installation simplified by integral load scale and travel indicators.**
- **All-steel welded construction meets pressure piping code.**

For hanger installations which are subject to highly corrosive industrial conditions — or where exposed to severe weather, Grinnell makes available two distinct lines of pre-engineered spring hangers.

These hangers are the result of extensive experimentation with various coatings for Grinnell's standard pre-engineered spring hangers. In addition to providing flexibility in pipe suspension, they provide versatility of application through their corrosion-resistant characteristics.

1. NEOPRENE COATED — for highly corrosive conditions, such as those found in chemical plants and refineries. All parts of the hanger are neoprene coated to protect the base metal from a wide range of corrosives. The flex life of the spring is unaffected by the neoprene . . . the coating resists cracking or flaking over a wide temperature range.

2. GALVANIZED — for outdoor installations, where weather conditions are severe. All parts of the hanger are galvanized except the spring, which is neoprene coated to avoid alterations of temper, hydrogen embrittlement and decreased flex-life of the spring — usual hazards to springs from the galvanizing process. Write for further details.

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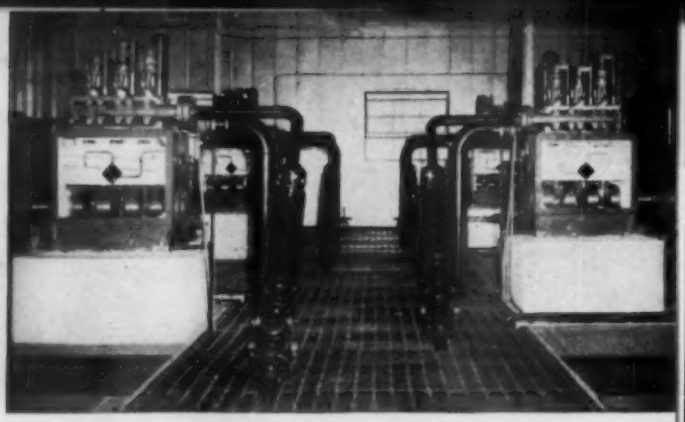
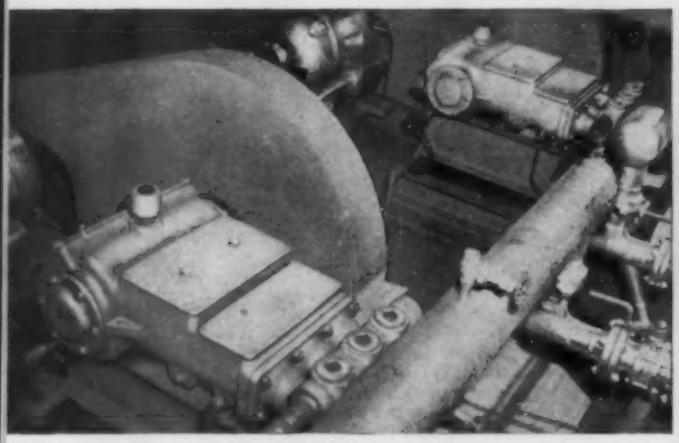
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

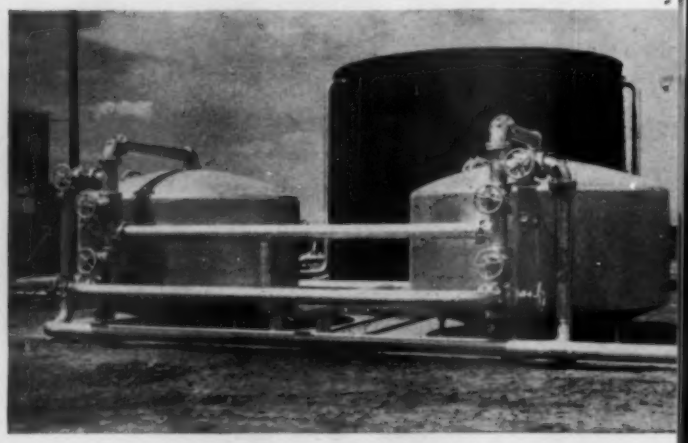
Bethlehem designed and turnkeyed this waterflooding installation in West Texas.



Installation of four vertical high-pressure water-injection pumps.



Bethlehem TP-3 triplex plunger pumps (injection service).



Filtration units, completely installed with necessary piping, valves, gages.

What Bethlehem can do for you in

WATERFLOODING

For almost 20 years Bethlehem Supply has been closely associated with secondary-recovery programs in the Mid-continent area. Bethlehem was, in fact, the first major supply company to offer specialized engineering service for large-scale waterflood projects.

Today, Bethlehem's function is threefold: (1) To work with producers, producers' engineers, and consultants in the planning of pumps, prime movers, piping, etc. (2) To lay out plants, piping, and metering systems to customer specifications. (3) To furnish equipment, in full or in part, for such layouts. On turnkey jobs, Bethlehem supervises construction work and provides all items of machinery and other equipment.

For a layout combining simplicity with the best in automation, call Bethlehem. Our engineers are equipped to work with you in every phase of the job—from the blueprint stage to the completion of the project.

Typical Waterflood Equipment furnished by Bethlehem

Water-Supply Pumps · Injection Well-Head Equipment
Injection Pumps · Treating and Filtration Equipment
Pneumatic and Electric Controls
Tanks (welded, bolted, wood) · Line Pipe, Casing, Tubing
Plastic and Cement-Lined Pipe
Fittings (welding, threaded, grooved, plastic)
Prefabricated Steel Buildings

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BETHLEHEM SUPPLY

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STOPS RUST!®

and matches ORIGINAL EQUIPMENT

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Distinctive as your own fingerprint. Accept no substitute.

How much does rusty equipment cost *you?* With Rust-Oleum, you STOP RUST—and you match original equipment colors, too, for long-lasting protection!

We want you to see for yourself how *easy* it is to use Rust-Oleum . . . actually take the brush and see how smoothly it works, how it dries to an *attractive, high-gloss finish* that resists sun, fumes, rain, heat, snow, salt air and salt spray, and blowing dust and sand. And the same formula can be applied by brush or spray. Just check the coupon for the color you want . . . and attach it to your business letterhead for a FREE TEST SAMPLE. No cost or obligation.

Your Rust-Oleum Distributor maintains complete stocks for immediate delivery.

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Please send me a FREE TEST SAMPLE in the color checked.

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- ☐ H-4 Caterpillar Yellow
- ☐ 722 Bethlehem Yellow
- ☐ 728 Old Emsco Green
- ☐ 726 New Emsco Green
- ☐ 727 New Unit Rig Gray
- ☐ 724 Waukesha Gray
- ☐ 725 New National Blue
- ☐ 723 Oil Well Orange

TD-14's with inside

...5 MINUTES AFTER THE

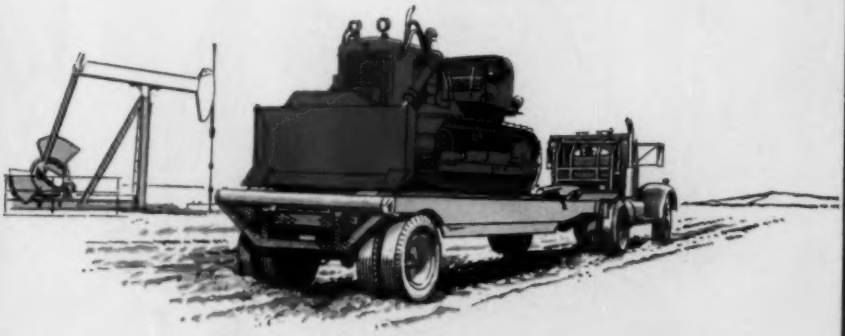
Only eight feet wide—so the TD-14 with inside mounted 'dozer makes an ideal outfit for hard digging because the narrower-than-standard blade concentrates dozing hp. The 8-foot blade is the same width as a standard lowboy trailer, allowing fast transport over highways, day or night, without permits!

dozers "move out"

PIT IS DUG!

—for Sullivan & French, Fox, Okla.

Sullivan & French, Fox, Oklahoma, own three TD-14's for contract work in the nearby oil fields. This TD-14 is carving a salt water pit in hard clay. Full-floating TD-14 track-roller seals exclude grit, retain lubricant so efficiently that the lubrication interval is extended up to 500 hours!



Concentrate the International TD-14's full push through the inside-mounted 8-foot-wide dozer blade—and you get tremendous digging and earth-rolling action!

The outfit shown is one of three TD-14's owned by Sullivan and French, Fox, Oklahoma. Even in hard, dry clay this rig gouges out a salt water pit in short order.

And five minutes later, the easily transportable TD-14 can be highballing to the next job. The operator simply drives it on a lowboy—chains it down—and heads for more pay-dirt!

Seconds-fast International gasoline-conversion starting readies the TD-14's diesel engine for full-load performance. Clean deck design, control tower visibility, and full-time Hydraulic booster steering provide vital operating ease and safety for rough-and-tumble oil field work.

No wonder a TD-14 equipped with inside-mounted dozer can do in one day several oil field jobs that are miles apart!

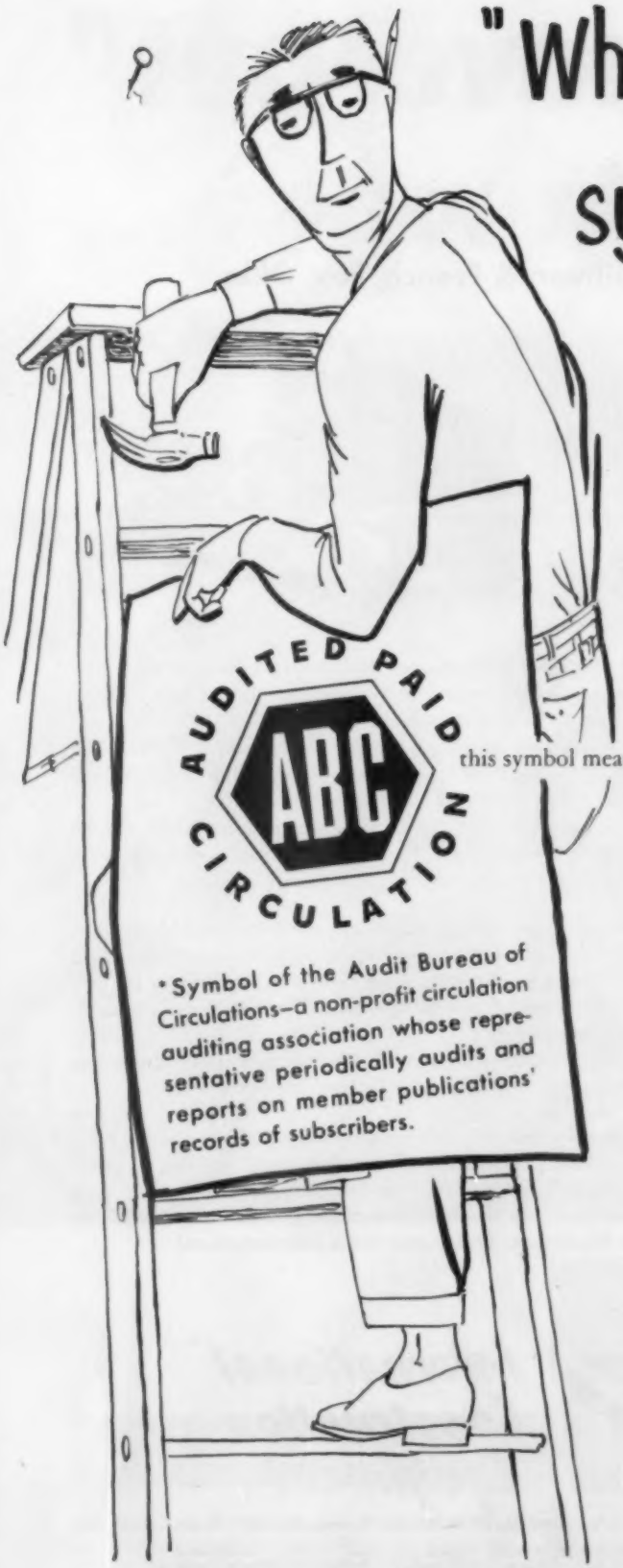
Prove TD-14 capacity and all-around operating economy on tough roadbuilding, drill-site preparation, pond building or other oil field work. Then profit by its fast mobility and job-hopping speed with an inside mounted dozer. See your International Construction Equipment Distributor for a demonstration!

International® Construction Equipment

International Harvester Co., 180 N. Michigan Avenue, Chicago 1, Illinois

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.

"What does this symbol* mean to YOU ?"



*Symbol of the Audit Bureau of Circulations—a non-profit circulation auditing association whose representative periodically audits and reports on member publications' records of subscribers.

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CABLE—CPHAR

To our Friends and Customers:

Combining two well-known names in the oil equipment industry, CP-Harrisburg is a new company formed to provide improved service and distribution to the oil well drilling industry. The newly organized firm will handle world-wide distribution and service for Harrisburg "Diamond-Hard" products...and for Chicago Pneumatic rock bits, drill collars, and other oil well drilling equipment manufactured in the Fort Worth plant of Chicago Pneumatic Tool Company.

Chicago Pneumatic has manufactured drilling bits and other oil field equipment for more than 28 years and has been an honored name in American industry for 63 years. Harrisburg Sales & Service, Inc., has been supplying the oil industry with "Diamond-Hard" pump expendables and other products since 1930.

Although CP-Harrisburg will market both Chicago Pneumatic and Harrisburg products, it is not a subsidiary of either company but will operate independently. The primary aim of the new company will be to provide greatly accelerated service and distribution of Chicago Pneumatic and Harrisburg products through authorized oil field supply companies.

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PRINTED IN U.S.A.

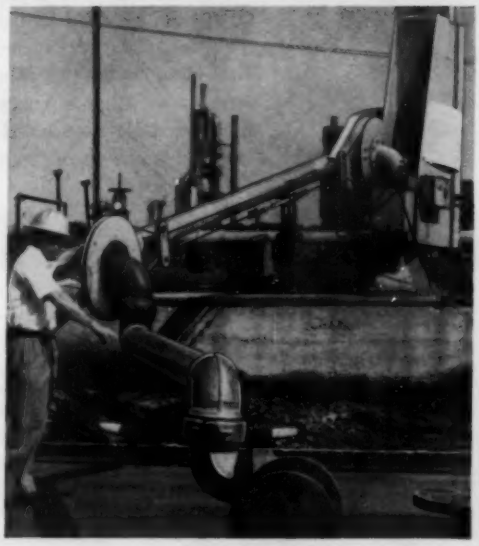
CHIKSAN

PREVENTS LINE HANDLING INJURIES
SPEEDS BARGE LOADING
ELIMINATES HOSE BURSTS
SLASHES REPLACEMENT COSTS

The Chiksan Barge Loading Arm ends hazardous manhandling of loading hoses, eliminates dangerous dock clutter. Mechanical operation makes hookup fast and simple.

Gear reduction enables one man to adjust the flange position anywhere in a 105° vertical range. Outboard arm is manually swung into position at any point in a 130° horizontal arc. The eight inch model rotates 360° to permit servicing barges on both sides of a narrow dock. Once hookup is made, the arm can be left unattended while free wheeling allows the unit to ride free during loading and unloading. When not in use, the arm is raised up and out of dockside traffic.

6″ x 25′ and 8″ x 28′ sizes available. Handle petroleum products, both black and bright, and mild caustics in any temperature ranging between —60° F. to +225° F. Service all river and lake barges and lake tankers including those in 25,000 barrel class.



The Chiksan Barge Loading Arm is designed to reach approximately 20 feet from dock riser to barge flange. Total length of Arm is 25 feet.

fmc **CHIKSAN**

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58-36

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Please send me your Barge Loading Arm Bulletin #456.

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BULK CEMENTING

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by HALLIBURTON

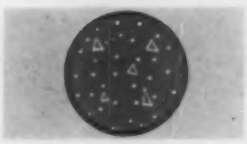
Halliburton Bulk Cementing, the industry's first and finest service of this type, matches the high standards set by all other Halliburton oil well services. From bulk plant to set cement down hole, Halliburton cementing materials, equipment, tools and personnel work together every day to give your well the protection it requires for greatest production and profit.

Specially formulated additives utilized in Halliburton Bulk Cementing help your well meet such challenges as possible sulfate or salt water corrosion, elevated temperatures and pressures, weak formation problems and numerous others. Special cements, too, are available where required. Automatic batch weighing equipment in Halliburton bulk cement plants assure smooth homogeneous mixtures in the correct proportions.

For the best buy in oil well cementing service, specify Halliburton. Most trusted name in oil well cementing.

BETTER CEMENTING BEGINS WITH BETTER BASIC MATERIALS

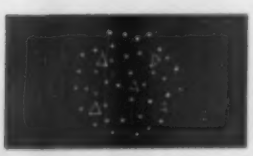
POZMIX CEMENT



Petroleum technology has yet to discover a material equal to pozzolanic cement for providing lasting oil well protection against the hazards of corrosion, contamination, and ineffective bond between pipe and formation. Two basic types of pozzolanic cement—a blend of Pozmix with portland cement, (Pozmix Cement), and a blend of Pozmix with hydrated lime, (Pozmix 140); are commonly used for oil well cementing.

Pozmix Cement can also be utilized with chemical additives such as retarders, accelerators, and low fluid loss additives, for better control during the cementing operation. Pozmix 140 is designed to obtain long pumpability and strength stability in wells where temperatures range from 140° F to 400° F and higher.

NEW! HALLIBURTON GILSONITE CEMENT



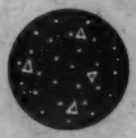
Gilsonite is a new additive used to lighten cement slurry weight down to 10 lb./gal. With a specific gravity almost as light as water (1.07), it adds volume but not weight to the slurry; setting characteristics are not appreciably affected . . . compressive strength is good. Due to its graded particle size, Gilsonite has very low fluid requirements: each 50 lbs. needs but 2 gals. of water. Will not take water from a slurry even under pressure. Unsurpassed for lost circulation or weak formation problems; much less Gilsonite Cement is required

LATEX CEMENT

A low fluid loss cement, with superior perforating properties, especially recommended for primary casing cementing . . . "tail-in" on primary cementing jobs . . . squeeze cementing . . . cementing liners.

HI-DENSE

A high specific gravity weight material designed to increase the density of cement slurry for controlling high pressure gas and oil zones. Hi-Dense is ground to a fineness that requires a minimum amount of mixing water. Because of the specific gravity of Hi-Dense, it is possible to weight cement slurries to 20 lbs./gal., yet still maintain adequate pumpability and strength stability at high temperatures.



GEL-CEMENT

Reduced slurry weight, increased slurry volume and lower costs are three benefits resulting from the use of HOWCOGEL, a high yield bentonite additive for cement. When mixed with mud, it provides low fluid loss, reduces filter cake thickness and has high gel-strength properties. Halliburton's Flocele added to Howcogel gives additional sealing strength to these light weight slurries.

HR-4 RETARDER

A small amount of HR-4 added to the mixing water or the dry cement at Halliburton bulk plants results in a composition with a retarded set, permitting placement at high temperatures. It is used with portland, Pozmix Cement or Pozmix 140 Cement in the deepest of wells.

HR-7 DISPERSANT AND RETARDER

Used mostly in wells of moderate temperature, HR-7 is a chemical dispersant and retarder designed for high gel cement compositions. HR-7 is effective in obtaining smoother and more fluid gel cement slurries.

HA-5 ACCELERATOR

HA-5 is an improved accelerator for oil well cementing slurries to be used for surface pipe or shallow wells. Higher compressive strengths at early ages are obtained, permitting W. O. C. times as short as four hours on surface pipe at temperatures of approximately 80° F.

HALLIBURTON

CEMENTING SERVICES

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284 SERVICE CENTERS—JUST MINUTES AWAY FROM YOUR WELL

New drawworks for faster, more efficient drilling

700 to 1200 HORSEPOWER

MID-CONTINENT U-712-A

This all-new U-712-A drawworks, rated at 700-1200 net input horsepower, incorporates many outstanding features to increase drilling speed and efficiency. Manufactured by Unit Rig & Equipment Co., a subsidiary of Mid-Continent Supply Co., the U-712-A includes these important advantages:

- **NEW** **Unitized controls, conveniently located in a single console, result in greater operational efficiency.**
- **NEW** **Grease lubrication of bearings with flood lubrication provided for chains, sprockets and splined clutches.**
- **NEW** **Self-equalizing 48" diameter brakes designed for rapid, drag-free release and smooth feed-off operation.**
- **NEW** **Fawick VC clutches mounted on the drum shaft for low and high drives, with an emergency splined clutch provided for the low drives.**

The U-712-A is designed as an integral drilling unit which includes hoisting drum, transmission, rotary drive and auxiliary brake. For complete information, write for our U-712-A Bulletin or contact your local Mid-Continent representative.

DW3-8

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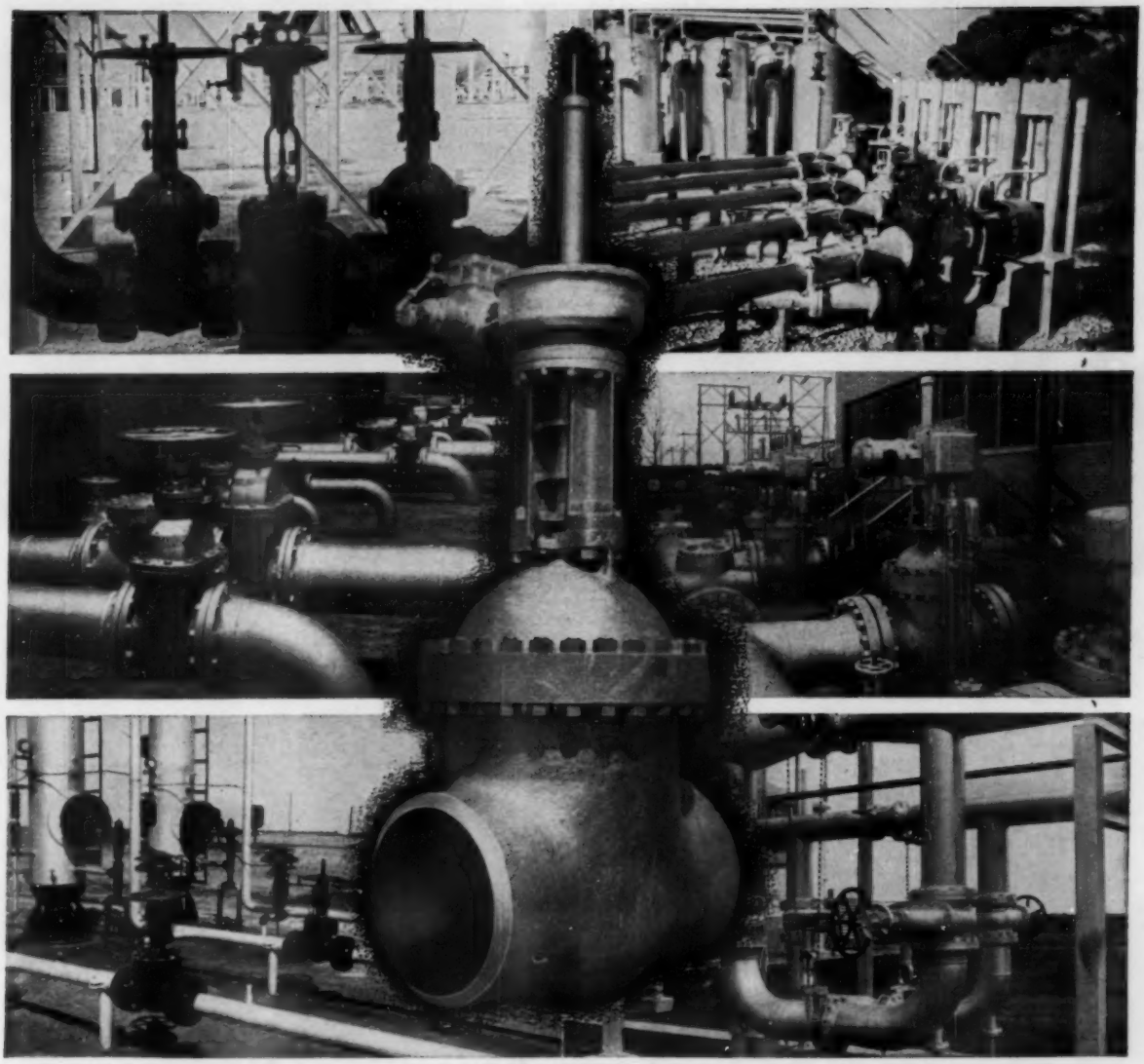
THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY



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ALL the Darling gate valves shown here, from the large 30″ main line valve to small 4″ loading pump valves share identical multiple advantages. They operate with the positive yet easy closure . . . the uniform wear distribution . . . the elimination of disc-to-seat galling . . . the adjustment for valve body distortion . . . the minimum, simplified maintenance and the extended, trouble-free service life made possible by the well-proved fully revolving double disc gate principle perfected by Darling.

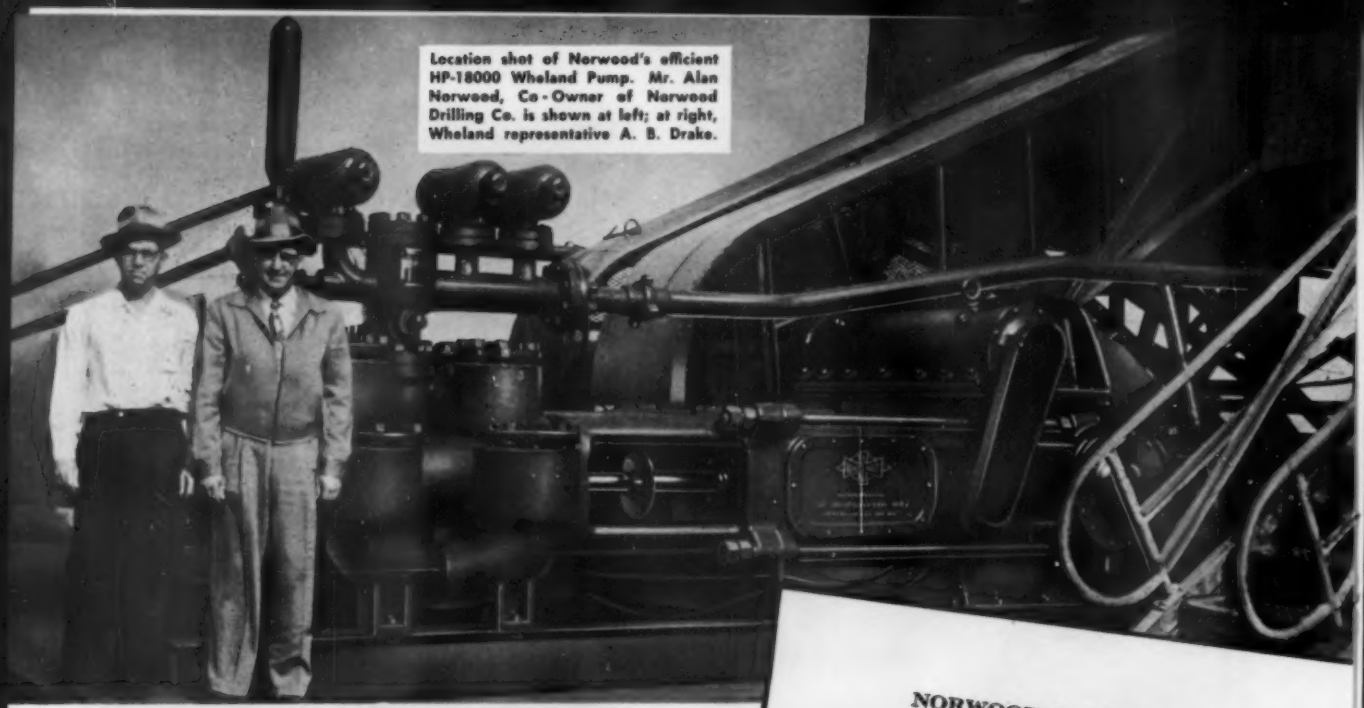
Why not check into Darling gate valves for your next requirements? Find out *how* they assure all these advantages . . . and let us give you proof! Write for Catalog No. 57.

DARLING VALVE & MANUFACTURING CO.

Williamsport 1, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

DARLING VALVES



Location shot of Norwood's efficient HP-18000 Wheland Pump. Mr. Alan Norwood, Co-Owner of Norwood Drilling Co. is shown at left; at right, Wheland representative A. B. Drake.

PERFORMANCE!

". . . has fully met our expectations on performance . . ."

"have had no expense on this pump"

WHELAND HP-18000

DUPLEX SLUSH PUMP

7¾" x 18", 750 HP Nominal Input at 60 RPM.
Discharge Pressure with 7¾" liner, 1322 PSI;
Discharge Pressure with 5½" liner, 2700 PSI.

BULLETIN ON REQUEST

NORWOOD DRILLING CO.
WICHITA NATIONAL BUILDING
WICHITA FALLS, TEXAS

January 21, 1958

Mr. Gordon P. Street
The Wheland Company
Signal Mountain Road
Chattanooga, Tennessee

Dear Mr. Street:

We operate six rigs in West Texas and New Mexico area; depths range from 5,000 feet to 14,000 feet.

The Wheland HP-18000 pump we bought more than a year ago has been in the West Texas area working on wells between 10,500 feet and 13,500 feet. It has fully met our expectations on performance and so far we have had no expense on this pump.

Yours very truly,

NORWOOD DRILLING COMPANY

By: Alan Norwood
Alan Norwood

WHELAND

ROTARY DRILLING MACHINERY

THE WHELAND COMPANY

CHATTANOOGA, TENNESSEE, U.S.A.

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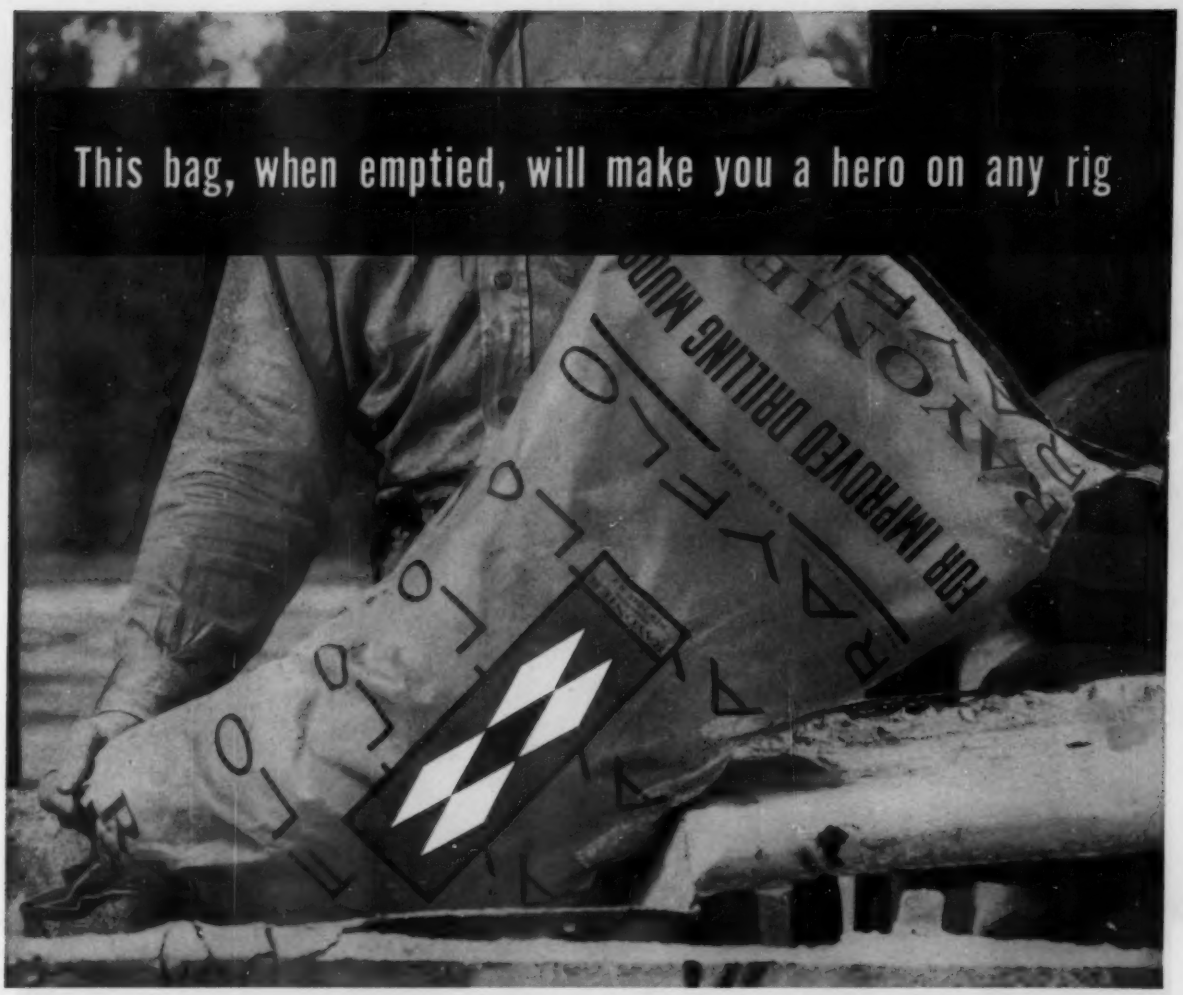
EXPORT DISTRIBUTORS: LUCEY EXPORT CORPORATION—233 Broadway, New York 7, New York—Broad Street House, London, E. C. 2, England.



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Ask any savvy oil man. Or for more facts, write to: **George E. Durkee,** Technical Representative, Rayonier Incorporated, 161 East 42nd St., New York 17, N. Y. Of course, no obligation to you.

FOR UNCOMMON SAVINGS ***The Newest Dispersant—TANFLO, a Rayflo blend***

New, low-cost Tanflo—scientifically blended with Rayflo—is compatible with most additives. Uniform in composition and effect, Tanflo holds mud costs to a minimum.

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R-P&C VALVES

DESIGNED FOR DEPENDABILITY

BAR STOCK VALVES FOR CLOSE CONTROL, ESPECIALLY SUITED FOR CLOSE-COUPLED INSTALLATIONS

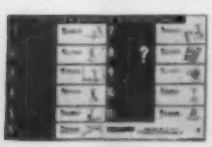
• rated for pressures up to 10,000 PSI •

• The bar stock valve, designed originally by R-P&C engineers, is really a versatile performer. First developed for instrument use, bar stock valves have proven to be the answer to valve problems of many different kinds. Designed for close control, they are ideal for throttling service. Their compactness makes them the natural choice for crowded locations such as panel boards. Economically priced, they serve in many applications as general purpose valves. And they are built in a wide variety of materials—can withstand extremely high temperatures and pressures.

For example, the **Fig. 1040-A Valve** shown here, made from carbon steel, is rated for 10,000 psi at 150°F. Each of these valves is individually tested at 15,000 psi before it leaves the factory.

R-P&C's complete line of bar stock valves includes constructions in 12-14 chromium stainless steel, 18-8 molybdenum stainless steel and bronze. Sizes range from ⅛" to 1" in globe and angle styles with female ends, male and female ends, or male union ends. For extremely severe throttling services, R-P&C bar stocks can be supplied with stellite discs for extra abrasion resistance.

Your R-P&C distributor carries not only a complete line of bar stock valves but also a wide selection of gate, globe, angle and check valves in bronze, iron, and cast and forged steel. You will find the answer to your valve problem in his selection.



FREE WALL CHART
"How to Protect Your Valves"
Installation pointers, operating tips, clues to longer valve life. They are all on this 22" x 17" wall chart. Write for your free copy.

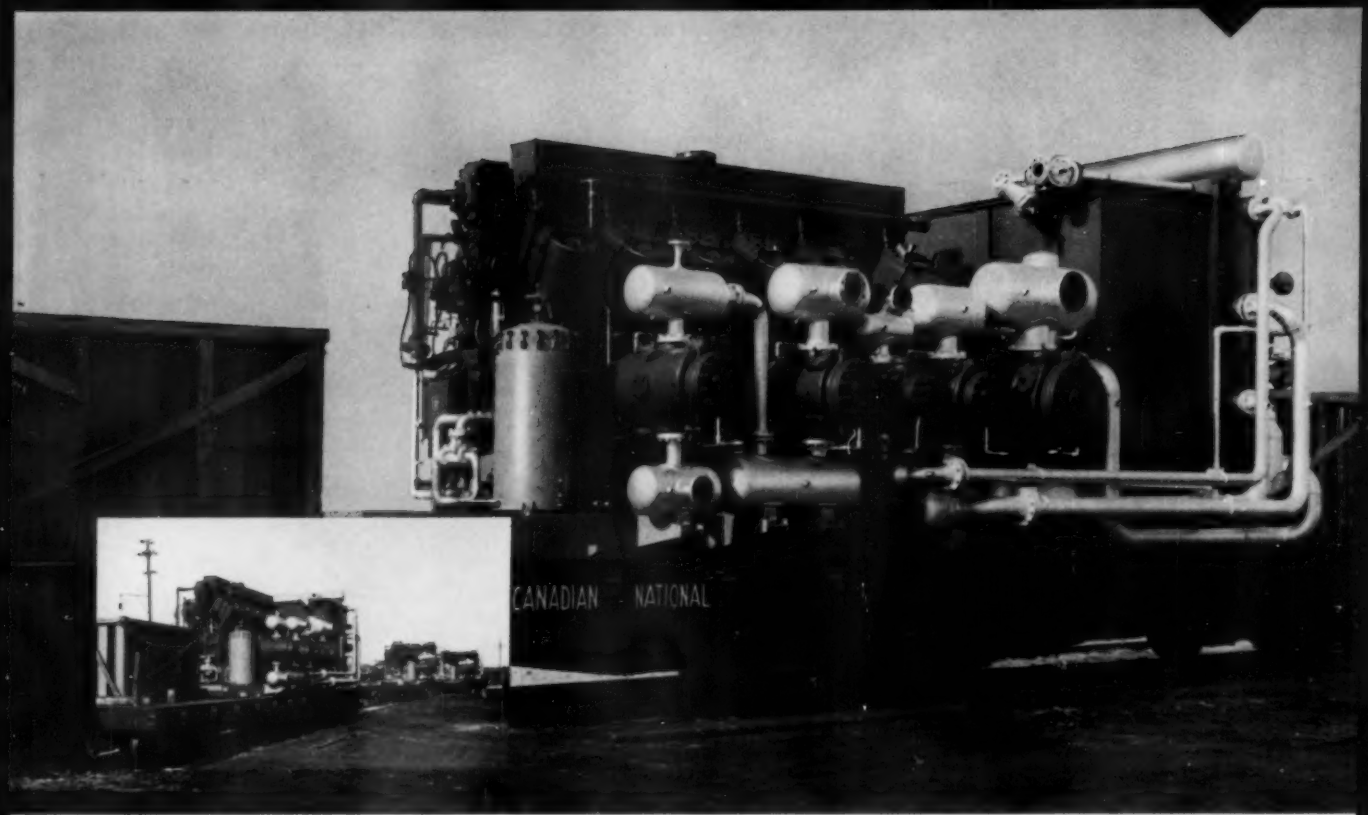
R-P & C VALVE DIVISION
AMERICAN CHAIN & CABLE

Reading, Pa., Atlanta, Boston, Chicago, Denver, Detroit, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

ACCO

BEAIRD-INGERSOLL-RAND Packaged Compressor Plant

Lowest Cost Per Horsepower Installed



CANADIAN BUILT Beaird-Ingersoll-Rand, 660 h.p. 12SVG packaged compressor units have Young radiators with up-draft air discharge. Interstage gas, engine water and lubricating oil cooling sections are built into the radiator. Other sizes from 120 to 660 h.p.

Beaird Packaged Compressors—

MADE IN CANADA

another AMF product

PACKAGED COMPRESSOR PLANTS

Packaged Compressors are just one of the many products manufactured by Beaird for the petroleum and petrochemical industries. When you are in the market for new equipment or assistance in developing a specialized product . . . contact Beaird for a qualified appraisal or quotation.

PRINTED IN U.S.A.

These three 660 h.p. Beaird-Ingersoll-Rand packaged compressor plants are among the first 18 Canadian-built units to be delivered by Beaird International, Inc., Calgary. This new Beaird subsidiary offers Canadian producers complete sales, service and available manufacturing facilities.

Designed for a major oil company, the units will serve a dual role in gas processing and boosting. Three stages will be used for gas boosting and two stages will handle propane for the chilling process. Another example of the flexibility possible in solving gas production problems, these compressors reflect Beaird's years of design and field experience.

With Canadian facilities, Beaird International offers a single source of responsibility from initial quotation to field service. Beaird offices in Caracas, Venezuela serve South American markets.

Wherever oil or gas is produced, there are skilled Beaird gas engineers to assist in finding an economical solution to your special operating requirements.

THE J. B. BEAIRD COMPANY, INC.
Shreveport, Louisiana

A Subsidiary of American Machine & Foundry Company

SALES OFFICES: *Shreveport, New Orleans, Louisiana • New York, New York • Tulsa, Oklahoma • Houston, Corpus Christi and Midland, Texas and Cie. Ingersoll-Rand, Paris, France.*

BEAIRD INTERNATIONAL, INC. SHREVEPORT, LOUISIANA • *Sales Offices: Calgary, Alberta, Canada • Caracas, Venezuela.*

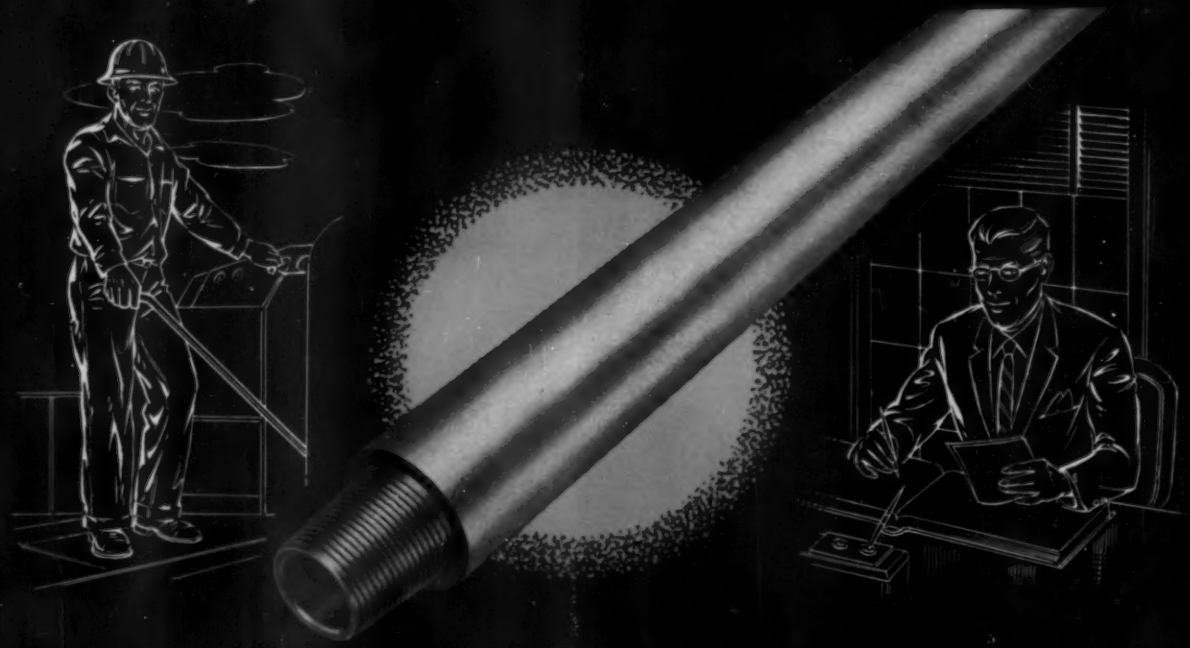
At 13,000 ft in the Caillou Island Field. The barge *Garry*, lonely outpost in these Gulf Coast waters, is equipped for deep and difficult offshore drilling. The job shown here is typical, with the hole at 13,000 ft and another 1600 ft to go. Location: Caillou Island Field, off the Louisiana mainland.

The *Garry* was custom-built for the Buster Gardner Drilling Co. Because of the heavy loads involved in handling the drill pipe, the owners specified Bethlehem rotary line in the 1⅜-in. size. (At the time of the photograph, this husky wire rope had accounted for 62,000 ton-miles and 55,000 ft of hole.) Also included in the *Garry's* equipment is 9/16-in. Bethlehem coring line with the rust-resistant bethanized coating.

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:

PETROLEUM • CONSTRUCTION • EXCAVATING • MINING • QUARRYING • LOGGING • MANUFACTURING



your driller and your accountant....
both of 'em like

BAASH-ROSS
Drill Collars

● Your cost accountant likes the **savings** shown by the consistent long service life of Baash-Ross drill collars, while your driller appreciates the extra margin of safety and dependability in Baash-Ross collars that keeps his string "turning to the right."

● Laboratory developed and field tested alloy steels are forged, turned, bored, threaded and heat treated under the most exacting of specifications and conditions to produce drill collars of outstanding quality. You can rely on your Baash-Ross drill collars to have perfect balance, accurately mating connections and the optimum combination of hardness, tensile strength and stiffness to meet every down-hole job requirement.

● Add to your drilling profits. Order your next drill collar string from Baash-Ross. You will find Baash-Ross representatives in every oil producing area in the free world.

BAASH-ROSS Lifting Type Thread Protectors positively protect drill collar threads and shoulders while in storage or transit and the strong built-in bail with the rounded "glide" greatly simplifies drill collar handling at the rig. Box and pin units screw together for convenient storage.

For full information see Composite Catalog or write Dept. B 9-8, P. O. Box 1348, Houston 1, Texas

BAASH-ROSS DIVISION
OF JOY MANUFACTURING COMPANY

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BAASH-ROSS JOY

FOXBORO d/p CELL

unequaled –

Simplest installation – orifice flange tap connections at standard spacing, are provided at both ends.

Drain and vent holes at lowest and highest points on both sides.

Purged cover protects transmitter from weather, dust, and fumes.

Over 60,000 now in use!

No zero drift . . . positive overrange protection . . . high sustained accuracy even under the most punishing operating conditions. No wonder over 60,000 Foxboro d/p Cell Transmitters have been installed since they were introduced in 1948.

By introducing the modern concept of high speed flow measurement and control, these differential pressure transmitters have *revolutionized* many an industrial process. Bulletin 13-11A shows how — and portrays the benefits the d/p Cell Transmitter offers you. Write **The Foxboro Company, 609 Norfolk St., Foxboro, Mass, U.S.A.**

FOXBORO

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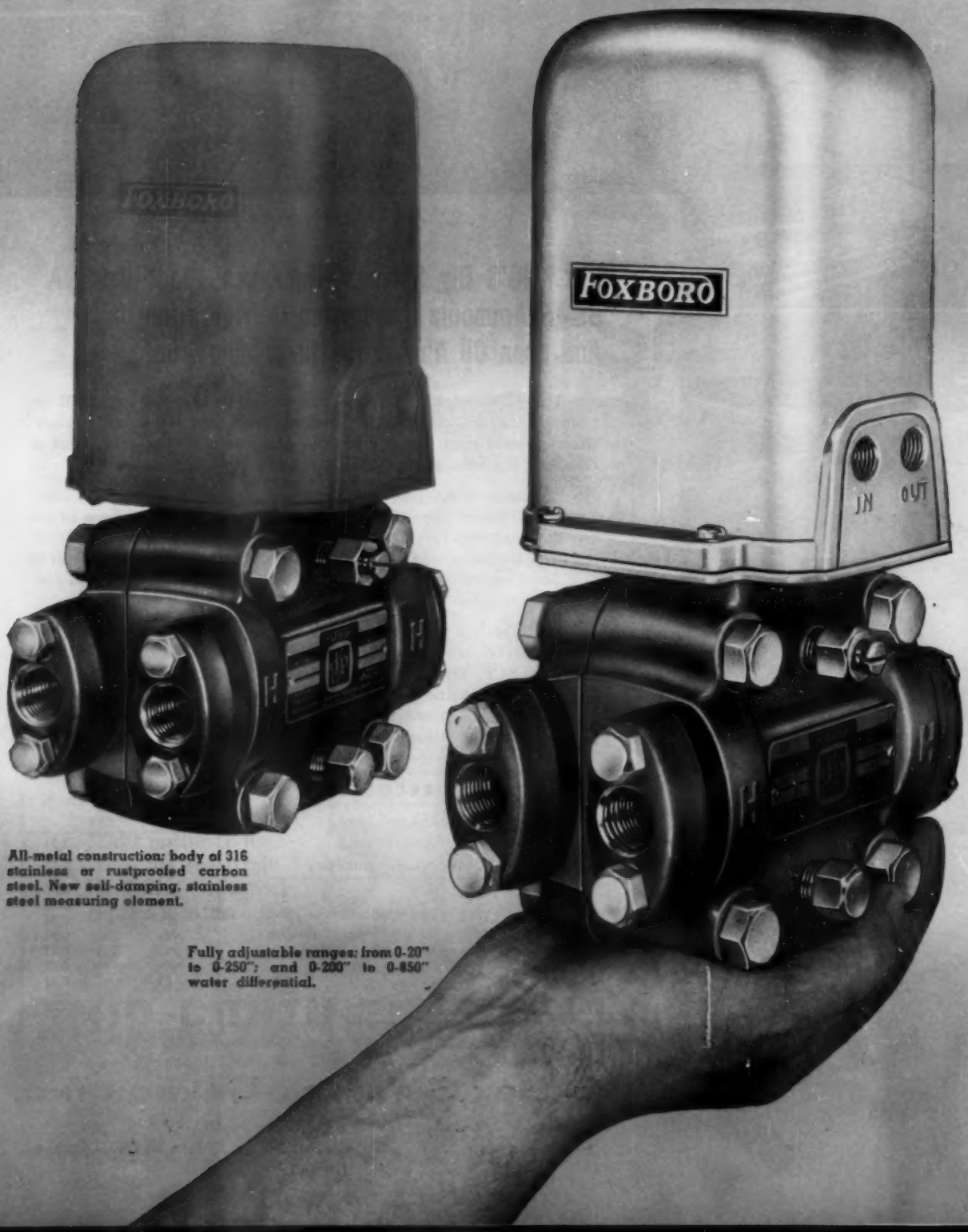
FIRST in Flow Measurement and Control

FLOW TRANSMITTERS...

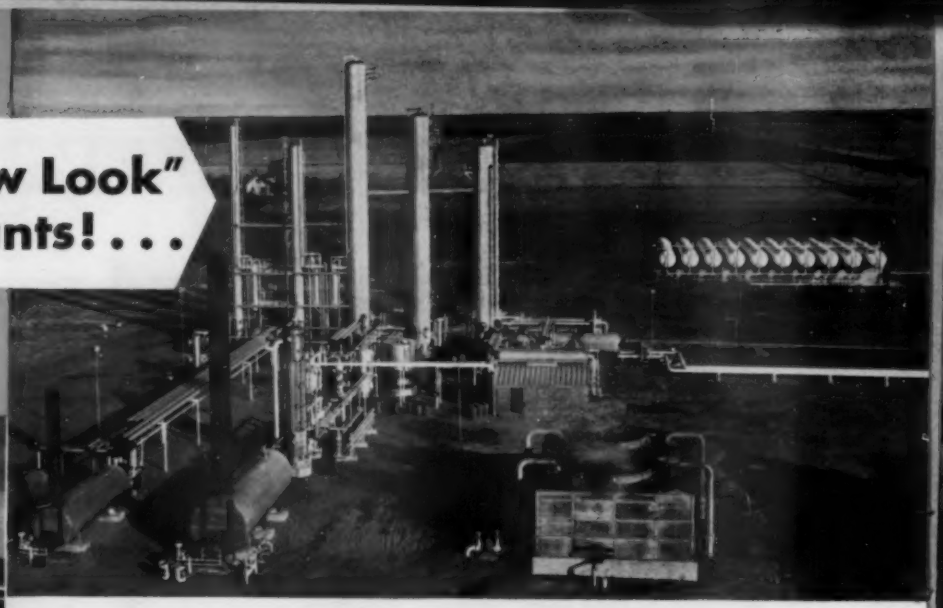
in accuracy, stability and performance

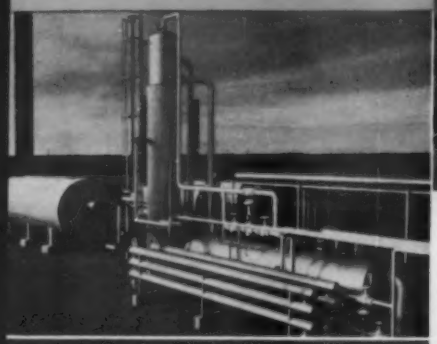


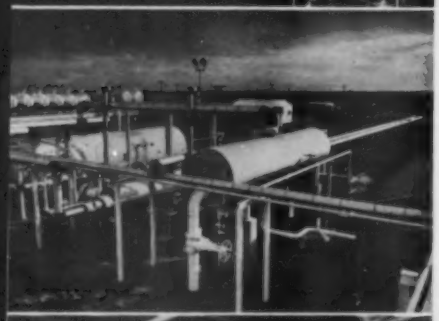
All-metal construction; body of 316 stainless or rustproofed carbon steel. New self-damping, stainless steel measuring element.

Fully adjustable ranges: from 0-20" to 0-250"; and 0-200" to 0-850" water differential.

Here's The "New Look" In Gasoline Plants! . . .







It's KNG'S Big Springs, Nebraska, Plant Using A BS&B Ammonia Absorption Refrigeration Unit And Lean Oil Absorption In Combination!

This plant—designed, manufactured and constructed by BS&B for Kansas-Nebraska Natural Gas Company, Inc.—uses 400 tons of refrigeration supplied by a BS&B Ammonia Absorption Refrigeration Unit to cool both the lean absorption oil and the inlet gas.

Gas enters at 800 psig and 110° F. with a water dew point of (—20° F.), and is passed through water to gas heat exchangers and gas to gas heat exchangers to bring the temperature down to approximately 30° F. It is then further cooled by the ammonia absorption refrigeration unit to 0° F., and enters the bottom of the oil absorber to drop out liquid condensed during the cooling period.

In the oil absorber, the gas at 0° F. is contacted with 140 molecular weight lean oil (also at 0° F.) at a circulation rate of approximately 2.3 gal./1000 SCF. The gas is then warmed to approximately 85° F. before going to the sales line, while the lean oil and absorbed hydrocarbons are passed through conventional fractionation equipment to produce propane, butane and natural gasoline.

PRODUCTS RECOVERED
PROPANE—25,258 gal./day
BUTANE—7,987 gal./day
GASOLINE 14#—6,009 gal./day

INLET GAS COMPOSITION (35 MMSCFD)	MOL. %
N_2	3.24
CO_2	1.37
C_1	80.86
C_2	8.73
C_3	4.43
iC_4	0.34
NC_4	0.57
iC_5	0.17
NC_5	0.17
C_6+	0.12
	100.00

For more information on the applications of BS&B Ammonia Absorption Refrigeration in gasoline plant construction, contact your BS&B Man—or write to . . .

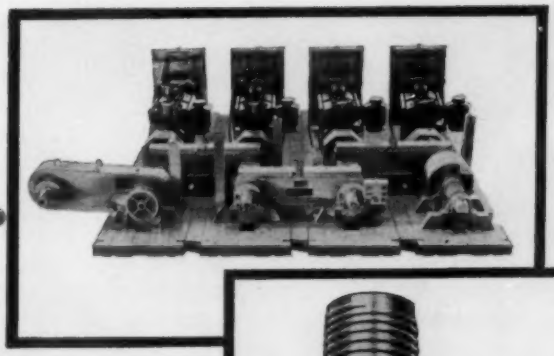
BS&B — EFFICIENCY — OVER 60 YEARS — RELIABILITY — ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

BLACK, SIVALLS & BRYSON, INC.

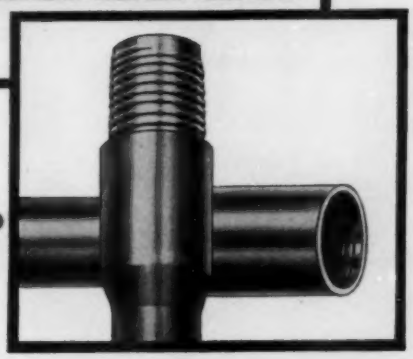
Oilfield Equipment Division, Dept. 1-A9

P. O. Box 1714 Oklahoma City, Oklahoma

Drives..



Drill Pipe..



Day and Night Service

from Mid-Continent where and when you need them....

Around the clock... wherever your location... depend on Mid-Continent for prompt supply of parts and equipment from the thousands of items carried in stock at your Mid-Continent field store. For complete in-the-field supply, visit your nearest Mid-Continent field store, or call your local Mid-Continent representative.

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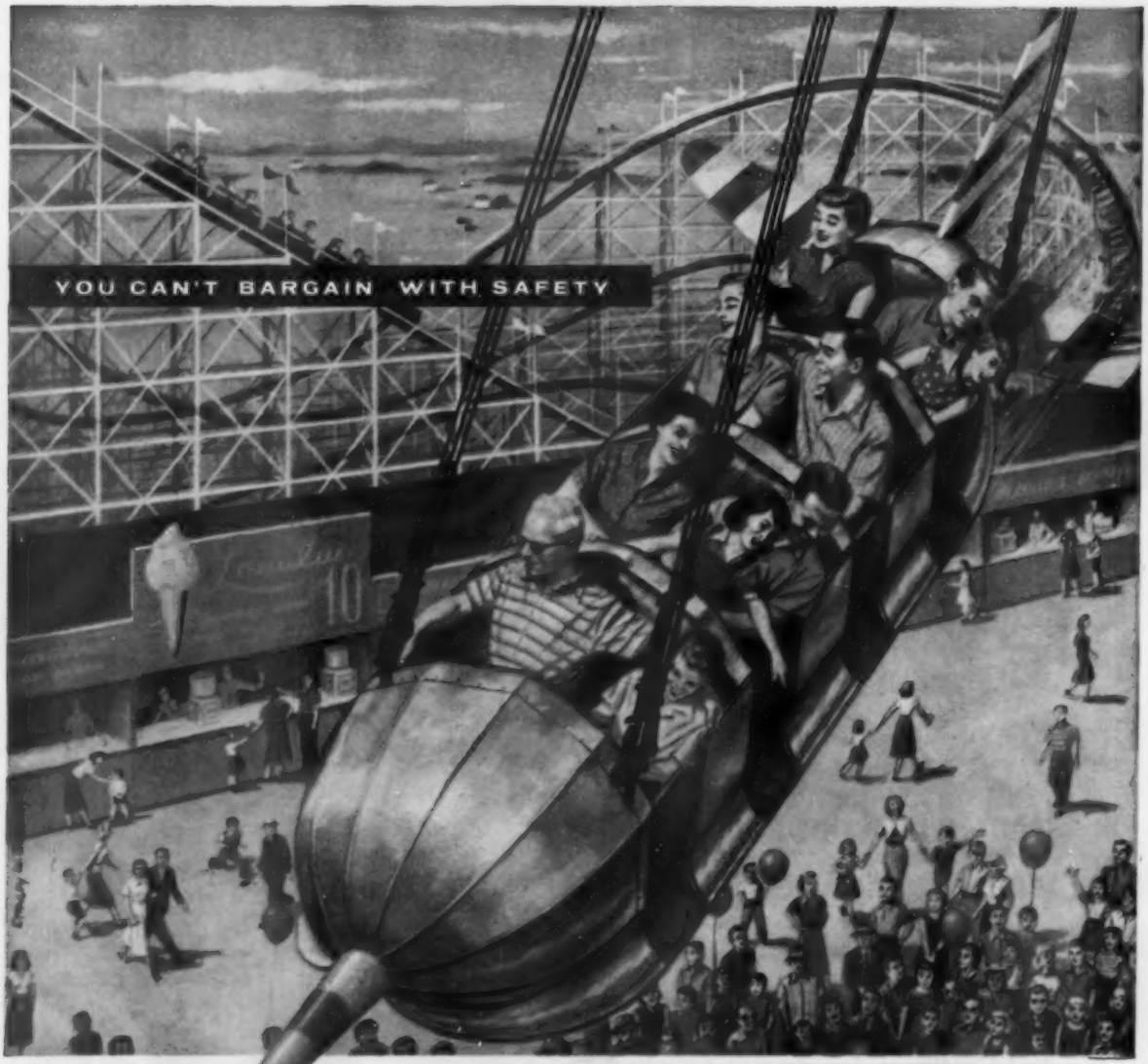
THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY



Amusement park operators* know that their rides must be exciting to be successful. But with the lives of riders and onlookers at stake, operators rely on *quality* wire rope to ensure . . .

a safe ride

Safety comes first, wherever wire rope is used. You may save a few pennies on the purchase of a "bargain" rope. But it will cost you *more* than you bargained for, if it results in injured personnel and wrecked equipment. Make sure you get *quality* wire rope—buy Wickwire Rope.

**Picture shows the Rocket Ride at Palisades Amusement Park, Fort Lee, N. J. Wickwire Rope provides the only support for each of these planes.*

CF&I WICKWIRE ROPE A CF&I PRODUCT

LOOK FOR THE YELLOW TRIANGLE

PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

THE COLORADO FUEL AND IRON CORPORATION—Albuquerque • Amarillo • Billings • Boise • Butte • Denver El Paso • Farmington (N. M.) • Fort Worth • Houston • Kansas City • Lincoln • Odessa (Tex.) • Oklahoma City Phoenix • Pueblo • Salt Lake City • Tulsa • Wichita • **PACIFIC COAST DIVISION**—Los Angeles • Oakland • Portland San Francisco • San Leandro • Seattle • Spokane • **WICKWIRE SPENCER STEEL DIVISION**—Boston • Buffalo • Chattanooga Chicago • Detroit • Emlenton (Pa.) • New Orleans • New York • Philadelphia 6347

International Petroleum Exposition

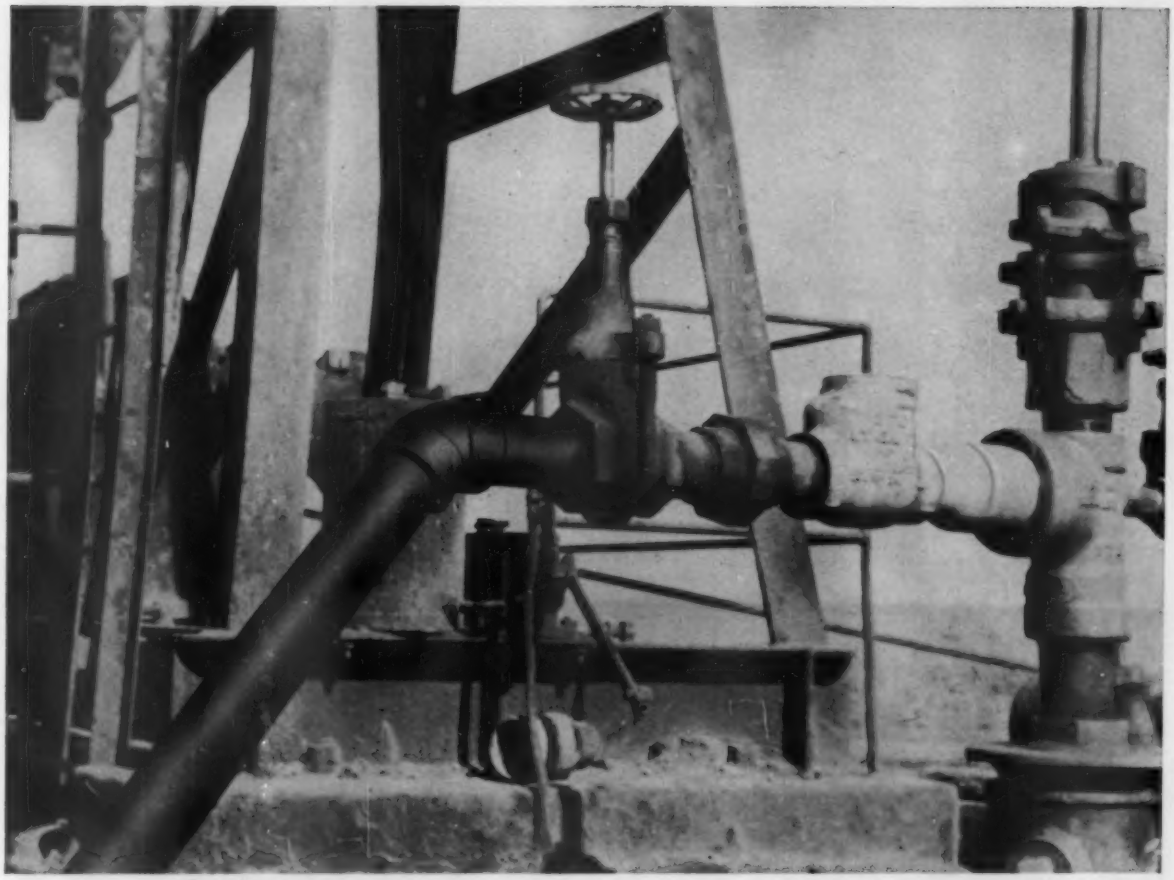
May 14-23 1959 • Tulsa, Oklahoma, U. S. A.

Night view of IPE with Tulsa Skyline

For Accommodations, write:
IPE Housing Bureau
Oil Capital Building, Tulsa, Oklahoma
For Space, write:
International Petroleum Exposition
P. O. Box 5205 Donaldson Station
Tulsa, Oklahoma
W. K. Warren, President
Wm. B. Way, General Manager

Dates of the IPE set in conjunction with World Petroleum Congress to be held in New York a week after the Tulsa Show

USCOFLOW PLASTIC PIPE



Mr. Usco says:

PIPE IN NEW SAVINGS with UscoFlow!

In these days of constantly rising costs, UscoFlow plastic pipe has become a big hit in the oil fields. Oil men will tell you it slashes plenty of overhead costs because UscoFlow is:

- Immune to galvanic corrosion.
- Highly resistant to both salt water and sour crude oil.
- Low in installation cost.
- Easily installed with solvent-welded fittings.
- Virtually maintenance-free.

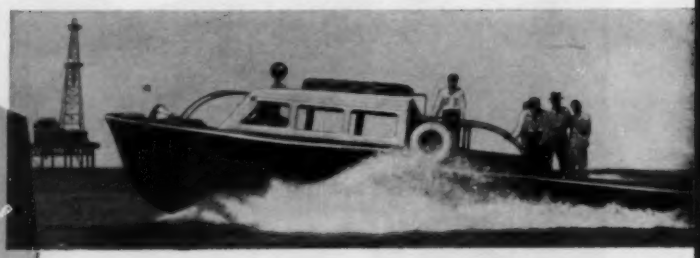
That's why UscoFlow Pipe eliminates the severe corrosive problems found in handling salt water and sour crude. *It brings savings in piping replacement and maintenance that will continue for an indefinite time.*

New, black UscoFlow Pipe has great impact strength and handles high pressures, yet is semi-flexible and light in weight. A complete line of pipe and fittings is available through supply stores in all oil fields.

Mechanical Goods Division

United States Rubber

See things you never saw before. Visit U. S. Rubber's New Exhibit Hall, Rockefeller Center, N. Y.



MORE WAYS THAN ONE

TO BE AN OIL MAN

Ask the toolpusher what he is, and he says he's an oil man. Ask the mud dealer, the wire line operator, the supplier. Ask the tool rental man, ask the man 'dozing the slush pits, the drilling contractor, the producer. They are all oil men. And the oil industry depends on all of them and many more.

The Oil and Gas Department of The National Bank of Commerce of Houston has helped and is helping all of these oil men. The Commerce can help you because it knows what it's talking about, and, even more important from your point of view, it knows what *you're* talking about. If you are planning to drill, if you are planning to extend needed services, if you are in the oil business, you'll find that The National Bank of Commerce will help you all the way.

E. O. Buck, *senior vice president*
Oil and Gas Department.

THE NATIONAL BANK OF

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OF HOUSTON

GULF BUILDING MAIN AT RUSK HOUSTON

Facilities of the Oil and Gas Department of The National Bank of Commerce of Houston are available in Wyoming, Nebraska, Colorado, New Mexico, Louisiana, Mississippi, and Texas.

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

When it gets in your drilling mud, sand like this can eliminate profits.

Glass-hard, it cuts pump parts, bit nozzles, and bit cutters. It increases maintenance costs, decreases bit footage, increases round trips. It increases funnel viscosity, increases mud weight and complicates mud maintenance problems. Generally, it plays hob with drilling costs and profits.

Everybody drilling through sand knows the damage it does, but the big question is how to take the sand out efficiently and economically.

There have been many efforts along this line—most of them only moderately successful.

SWACO and Dorr-Oliver, however, have developed a line of Dorrco D-Sanders that remove virtually all sand and drilled solids larger than 30 or 60 microns.

As a result of efficient performance, these units eliminate problems commonly associated with sand and drilled solids in mud.

Dorrco D-Sanders, distributed by SWACO, can be tailored to virtually any rig or drilling requirement. Write us for further information.

A size 6 D-Sander installed on a well in South Louisiana.

SALT WATER CONTROL Inc.

A Sid Richardson Development Company
1211 Ft. Worth National Bank
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Ft. Worth, Texas

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for quality
of product and service...

Mathieson ethanolamines are produced and shipped in accordance with your operating requirements. They are available in tank car,

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ETHANOLAMINES

tank truck and drum lots, directly from our modern organic chemicals plant in Brandenburg, Kentucky; and in tank trucks and drums, from large local stocks, through conveniently located distributors in key industrial areas.

Whatever your prime requirement... high quality, ready availability, technical service...for ethanolamines, contact your Olin Mathieson representative. Write today for further information and data sheets.

Polyamines
Ethanolamines
Ethylene Oxide
Ethylene Glycol
Ethylene Diamine
Diethylene Glycol
Triethylene Glycol
Dichloroethylether
Ethylene Dichloride
Surfactants (Poly-Tergents)
Polyethylene Glycols (Poly-G's)
Glycol Ether Solvents (Poly-Solv's)

Poly-G, Poly-Solv and Poly-Tergent are registered trademarks.

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ONE PARK AVENUE, NEW YORK 16, NEW YORK

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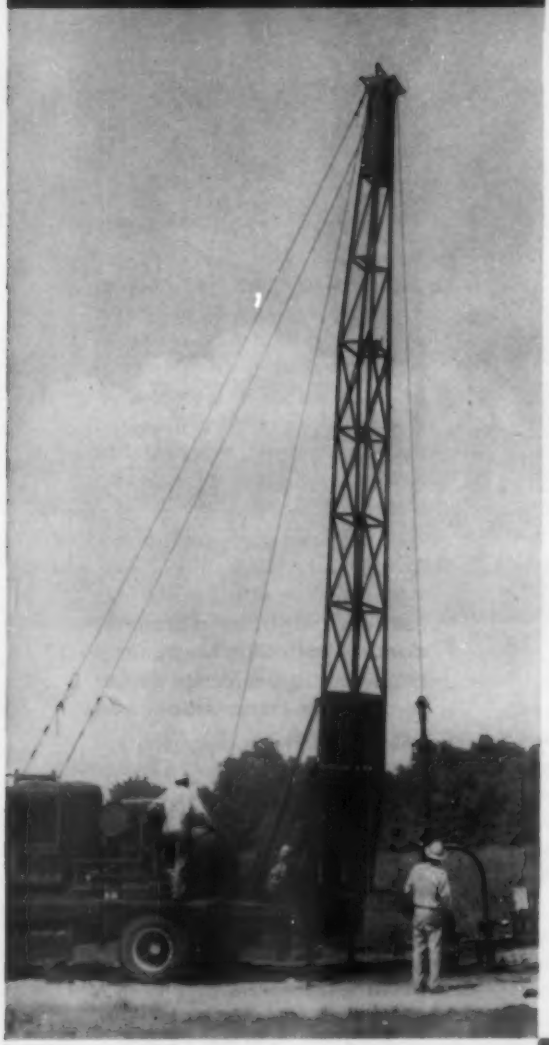
CONTROLLED SWABBING

with Guiberson Swabs



When you're ready to unload or swab test your well, Guiberson fast-falling swabs will do your job at the lowest possible cost.

You get better control of swabbing costs through selection of proper cup size and type. You can match the cup to the situation . . deep or shallow wells . . light, medium or heavy loads . . smooth, rough or tight tubing.

You get maximum control of results, too, when you use the right cup for your particular job. Maybe that calls for lifting lots of fluid fast . . or lighter loads at slower speeds to protect a permeable sand face. One of the several types of Guiberson cups in a wide range of sizes will suit the circumstances and you can put the well on production quickly.

Lift more fluid in fewer trips with Guiberson's fast-falling, smooth-pulling swabs.

Cups are compounded to Guiberson's exclusive formulas for maximum balanced resistance to oil . . acid . . abrasion.

THE
GUIBERSON
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ESTABLISHED 1919
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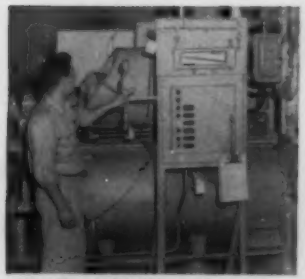
Sold by
Oil Field Supply Stores
Everywhere

Interior of Kemp Generator in action

Burned up by inert gas costs?

Come to Kemp



This Kemp 30,000 cu. ft. per hr. Inert Gas Generator meets all purging and blanketing needs at Gulf Oil's Port Arthur plant. Complete safety is assured with the more-than-adequate supply provided by the generator. Refineries everywhere depend on Kemp equipment.

Kemp Inert Gas Generators end the trouble and expense of bottled gas, provide a highly flexible source of supply at a fraction of the cost. With Kemp generators in your operation, you can make liberal use of inerts . . . apply them to the improvement of many other operations. There are Kemp units to manufacture inerts in any quantity, for any application.

Kemp equipment is dependable. You get rugged design, simplicity of operation, and almost complete elimination of maintenance. Each unit is completely protected with safety devices. The heart of the generator is the famous Kemp Carburetor, for precise control of inert quality, regardless of system demands.

Kemp produced inerts belong in your plant . . . for blanketing, purging, and protective uses . . . agitation of batches during cooking . . . conveying combustibles and controlling reactions.

For new installations or modernization programs, call in your Kemp Representative. Or write us for Bulletin I-10. The C. M. Kemp Mfg. Co., 405 E. Oliver St., Baltimore 2, Md.

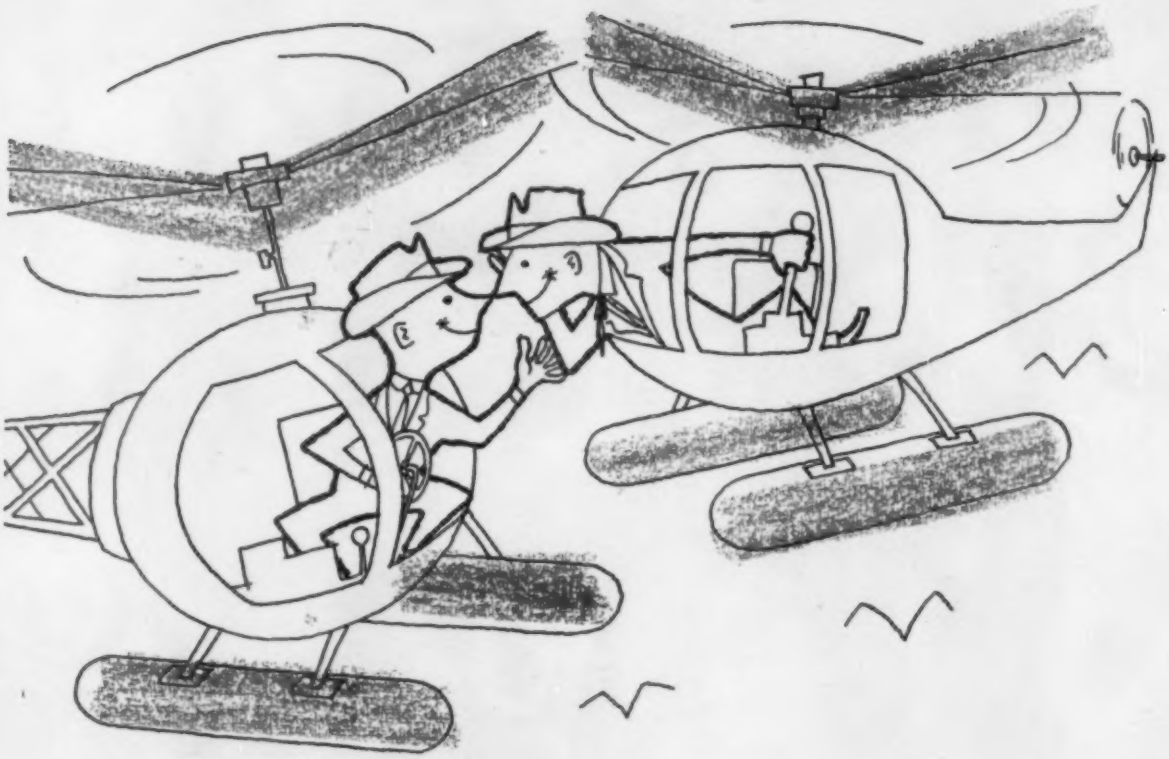
Kemp Convection Dryers

Kemp Immersion Melting Pots

KEMP
OF BALTIMORE

Kemp Industrial Carburetors

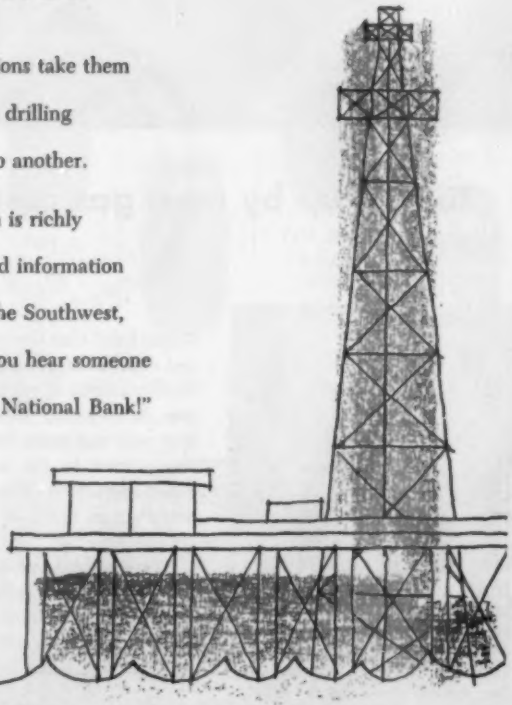
Kemp Oriad Dryers



"Wherever oil men gather"

● Oil men get around a lot. Their operations take them to field offices, to remote lands, to offshore drilling platforms . . . from one center of activity to another.

When they get together, their conversation is richly colored with the specialized knowledge and information characteristic of their profession. And, in the Southwest, wherever oil men gather, more and more you hear someone say, "For *my* money, it's The Fort Worth National Bank!"



85th ANNIVERSARY

THE FORT WORTH NATIONAL BANK

Helping Build a Greater Fort Worth and Southwest

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION
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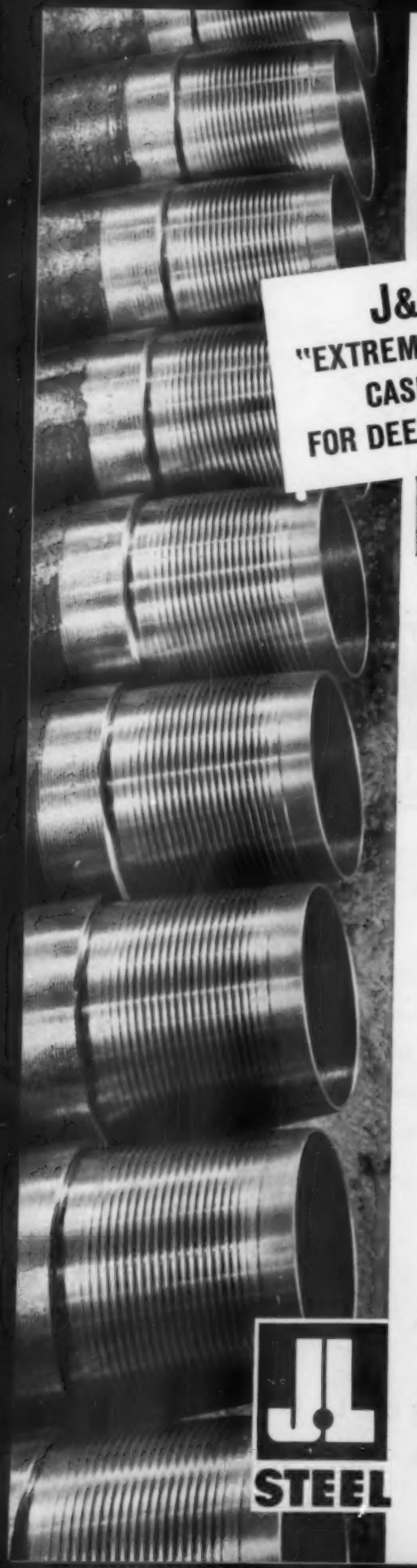
of *engineering know-how*

in oil
and gas handling
equipment

The PARKERSBURG RIG & REEL COMPANY

DIVISION OF PARKERSBURG-AETNA CORP.

PRODUCTION EQUIPMENT DIVISION OFFICES: P. O. BOX 13295, HOUSTON 19, TEXAS



J&L "EXTREME LINE" CASING FOR DEEP WELLS

High strength J&L Extreme Line casing was used as bottom-hole liner in this Shell Oil well in Louisiana.

J&L Extreme Line Casing provides leak-resistant bottom-hole liner for Shell Oil well

Over 1500 feet of 7-inch J&L Extreme Line casing were used as bottom-hole liner between 10,788 and 12,288 feet in this Shell Oil well in the Humphreys field near Gibson, Louisiana. "Extreme Line casing was used for its increased clearance and high leak resistance," said Shell Oil drilling superintendent.

Some important distinctive advantages to be found in J&L's superior-quality Extreme Line casing are:

HIGH JOINT STRENGTH. Modified Acme-type threads, with a steep flank angle, assure strong interlock. Integral joint eliminates coupling.

POSITIVE LEAK RESISTANCE. Accurately machined metal-to-metal surfaces provide a positive seal.

INCREASED CLEARANCE. Reduced outside diameter of joints provides necessary clearance in a tight hole.

HIGH RUNNING SPEED. Running rates are up to 50% faster. Broad, flat-crested threads guide pin end quickly into engagement without cross-threading. Joints are made up with two to four jerks after spinning.

Investigate the unique features of J&L's Extreme Line casing, available in J-55, N-80 and P-110 grades. Ask your J&L distributor or write to Jones & Laughlin, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

This L. D. Riggs No. A-2 well was drilled to 12,300 feet with a large steam drilling rig. 1500 feet of 7-inch 29# P-110 Extreme Line casing was used. Shell also used 2987 feet of 13⅜-inch and 7089 feet of 9⅝-inch N-80 J&L casing in this well.

J&L STEEL

Jones & Laughlin Steel Corporation

PITTSBURGH, PENNSYLVANIA

NEW WATERFLOOD PUMP

Worthington KCA pump offers you highest displacement, most pressure, low cost

The new KCA waterflood and salt water disposal pump has just been introduced by Worthington. This new pump has the highest displacement of all comparable competitive models—fully 23% more barrels per day. It also delivers the most pressure. And it's priced at only $38 per input horsepower.

The KCA has 6 outstanding economy and efficiency features:

1. **Interchangeable plungers** over widest available diameter range (1¼ to 2½ inches). Permits changes within any stuffing box range without changing fluid end. Available as ceramic or hardened stainless steel.

2. **Straight-flow design** for maximum volumetric efficiency.

3. **Maximum stuffing box accessibility.** There are no partitions in power end cradle.

4. **Suction air chamber,** packing and stuffing box cover are standard equipment.

5. **Large pipe connections,** 3 inch suction, 2 inch discharge on either side.

6. **Wing-guided valves,** liberally sized suction and discharge valves both removable through single top cover.

For details, see your Worthington district office. Or write: Worthington Corporation, Section 32-1, Harrison, N. J.

WORTHINGTON

HIGHEST DISPLACEMENT

Worthington KCA	2300
Brand A	1860
Brand B	1590
Brand C	1300
Brand D	1055

MAXIMUM DISPLACEMENT IN BARRELS PER DAY*

*At normal ratings. Some manufacturers, including Worthington, will permit higher speeds, capacity and horsepower after approving motion conditions. Best performance, however, is obtained by staying within normal ratings.

MOST PRESSURE

Worthington KCA	3100
Brand A	3000
Brand B	3050
Brand C	1490
Brand D	1850

MAXIMUM PRESSURE—PSI

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They Say—

Geochemistry makes a hit

Dear Sir:

Please send me at your earliest convenience 24 reprints of your entire series on geochemistry ("Fundamentals of Geochemistry," by Bartholomew Nagy, OGJ, June 30; July 14 and 28; and August 11 and 25). These have been very informative and interesting.

William H. Morris
President
Sinclair Oil & Gas Co.
Tulsa

Dear Sir:

This series on geochemistry is outstanding, even among the excellent articles regularly in your Journal . . .

Richard I. Maddox
Gulf Coast Representative
California Research Corp.
Houston

Dear Sir:

. . . A very interesting and pertinent subject.

T. Dean Mundorf
Plymouth Oil Co.
Denver

Dear Sir:

. . . Excellent.

Robert Morefield
Beverly Hills, Calif.

Dear Sir:

. . . A good reference work.

Ed Kiessling
State of California
Dept. of Natural Resources
Division of Mines
San Francisco

Dear Sir:

. . . The series is very informative and thought provoking . . .

C. W. Murphy
Ardmore, Okla.

Dear Sir:

. . . I think the subject matter is of such importance to oil finding that the articles should be brought to the attention of a lot of people.

W. C. Finch
Shell Oil Co.
Denver

(Editor's note: Requests for reprints of the series of articles have been received from 75 different companies, reflecting the growing interest in geochemistry and its application to oil finding.)

Natural gas as a commodity

Dear Sir:

The article "Give FPC Credit for Trying" in The Oil and Gas Journal of July 28 (p. 156), by Dr. R. S. Knappen, is most interesting and is very helpful in understanding some of the difficulties with which the Federal Power Commission is faced in view of confusion resulting from various court decisions.

One outstanding point, in my opinion, with regard to all natural gas "utility type" regulation, which is not mentioned by Dr. Knappen, is that apparently neither the FPC nor state commissions seem inclined to recognize that natural gas as such possesses any intrinsic value as a commodity; yet natural gas must be marketed largely as a fuel in competition with coal and oil which have measurable marketable worth as commodities.

While it is doubtless in the public interest to apply to the interstate pipeline systems a measure of regulation to govern rate of return on capital invested in transportation plant, the wisdom of attempting to apply any such theory to the production of gas itself as a commodity seems doubtful.

Willard P. Smith
Charleston, W. Va.

That unfortunate headline

Dear Sir:

For some years now I have read The Oil and Gas Journal with interest and expect to continue to do so for a number more.

It is my belief that your magazine is a credit to the industry and generally a strong factor in seeking a better understanding and relationship between the public and the oil industry. Certainly you are among the foremost in recognizing that the oil industry is a target largely for people who know relatively little about its problems and challenges.

Accordingly, I was disappointed in reading one of the headlines (cover) in the August 4 issue, "Oil Is Getting Off Easy in Congress."

Certainly you and I know what you meant. I question very much, however, whether many of the public into whose hands your magazine does get, or certain political elements would be anything but jubilant for the op-

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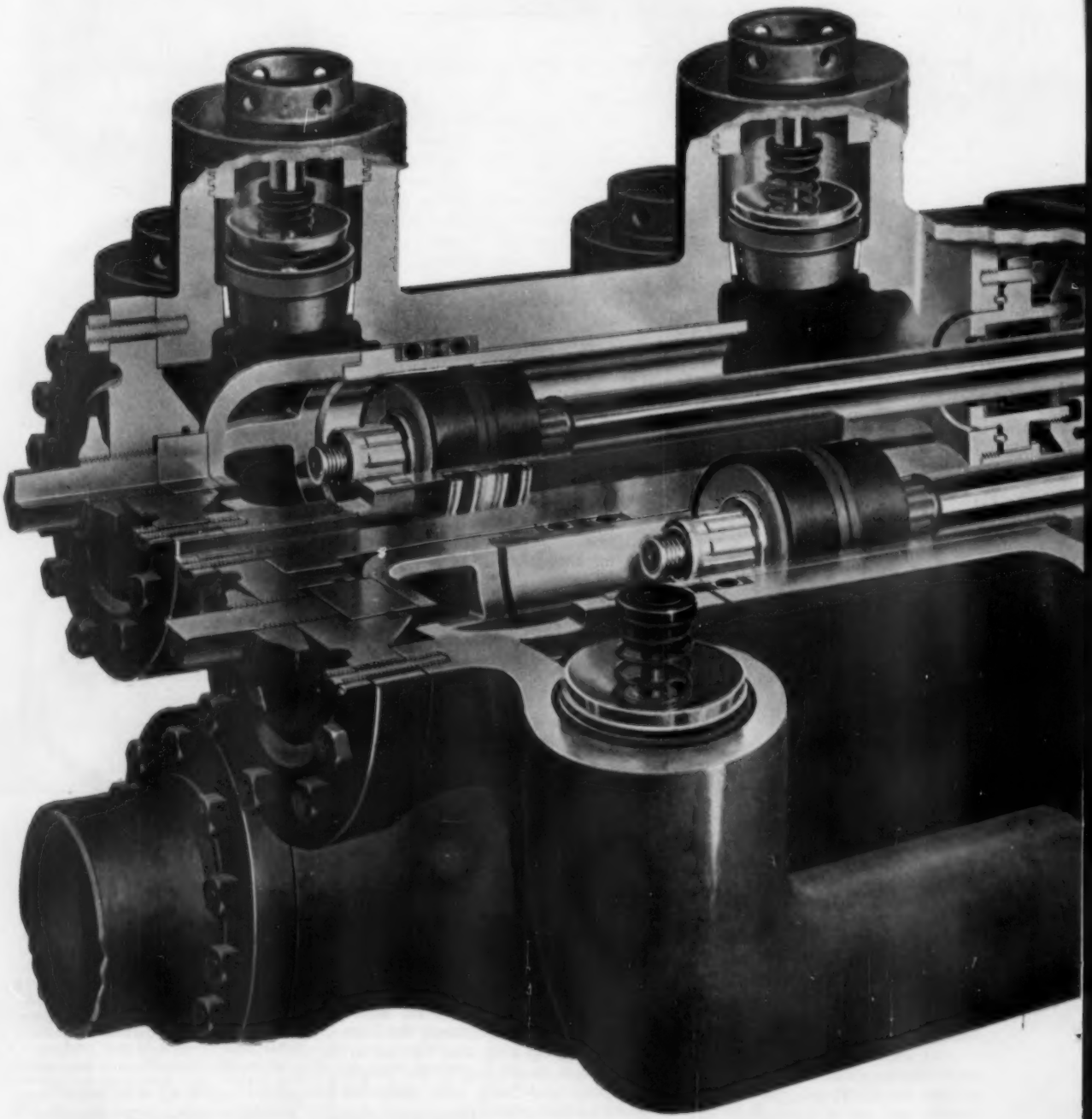

Since fluid-end pump parts must be correctly maintained for longest service, Mission has prepared a special Pump Maintenance Manual for your benefit. Write for your copy today!

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PUMP VALVES AND SEATS • SWABS • VALVES • HAMMERDRILS • CENTRIFUGAL PUMPS

# of Your Rig ..... by MISSION

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WE MADE THIS cutaway view of a mud pump so you can see just where the vital fluid-end parts fit and why they are essential to correct operation. Your mud pump is one of the hardest working parts of your rig. Forces on these fluid-end parts are staggering. For example, pistons and rods may be subjected to forces of more than 100,000 pounds. These forces may be multiplied by shock loading at times, and they are completely reversed at least once every second. When you remember that mud may contain abrasive sand to cut metal parts; corrosive chemicals to pit them, and oil to attack rubber, it seems obvious that only the best pump parts stand a chance.

LIKEWISE, MISSION MUD PUMP VALVES AND SEATS may withstand pressures ranging from a near vacuum to well over 3,000 psi. In addition to other severe conditions, valves are required to seal perfectly even though mud may be loaded with all types of lost circulation materials.

In this service, only parts of advanced design and materials can stand up. That's why Mission has been a leader in pump parts research for many years.

But, most important, Mission pump parts are built to be used together to give even longer service. Here are some concrete examples.

MISSION PISTONS AND MISSION LINERS work together. Each depends on the other for trouble-free operation.

Both liner and pump bore depend upon the liner packing for freedom from fluid cutting. *MISSION SUPER-SERVICE® LINER PACKING* features exclusive "zero clearance" confinement of packing rings that multiply packing life many times.

Furthermore, accurate machining of the liner outside diameter of Mission Liners means longer life for packing.

Now consider the connection between Piston and Rod. Each depends on accurate taper, precise alignment and correct surface finish of the other. Our gaging procedures are designed and maintained to insure the required accuracy for positive interchangeability of both piston and piston rod tapers.

PISTON RODS AND GLAND PACKING depend on each other for satisfactory service. From an economic standpoint, *MISSION SUPER-CHROME PISTON RODS* and *MISSION SELF-SEALING GLAND PACKING* make an unbeatable combination. The pressure-seal feature of the packing extends rod life while the non-pitting chrome surface of the rods extend packing life.

Now look at Valve Seats. The correct size, taper and surface finish of the seat can prevent costly pump deck washouts. Mission employs some of the most modern manufacturing and quality control techniques to assure perfect tapers.

When you consider that these Mission Pump Parts are in direct working contact with the drilling fluid, it is easy to see that they are vital to correct pump operation. When you remember that they work together for trouble-free service, it makes sense to specify all Mission pump parts—exclusively—in all your pumps. Your pumps will perform better, require fewer repairs and cost less to maintain when you do. The famous Mission Guarantee assures you of this service.

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BRONZE UNION BONNET GATE VALVES—Another valve of the rising stem type. All Williams gate valves, when open, present a full way, unobstructed passage through the body, fully equal to the area of the connecting pipes. In addition to all the benefits of valves of solid disc design, this new one-piece wedge assures necessary flexibility and perfect seating.

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portunity to misconstrue this unfortunate heading.

Raymond Plank
President
Apache Oil Corp.
Minneapolis

Price-war story excellent

Dear Sir:

This is to compliment The Oil & Gas Journal on the excellent article "Guaranteed Margins Get New Scrutiny" (OGJ, July 28, p. 112).

This is certainly very thought provoking and deserves wide distribution to all persons connected directly with the sales policies and sales activities of the oil industry from the chief executives on down to the station operators.

This subject and other material on "gasoline wars" should be written up in a series of articles and strong editorials to bring to public attention the cancerous growth and devastating effect of gas wars in the oil industry. . .

Kenneth S. Ritchie
Bankline Oil Co.
Bakersfield, Calif.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDER OF EVENTS

SEPTEMBER

7-12 American Chemical Society, fall meeting, Chicago.
10-12 National Petroleum Association, fifty-sixth annual meeting, Traymore Hotel, Atlantic City, N. J.
10-13 Intermountain Association of Petroleum Geologists, ninth annual field conference, Paradox basin.
14-19 Instrument Society of America, thirteenth annual instrument-automation conference and exhibit, Convention Hall, Philadelphia.
15-16 Independent Natural Gas Association of America, annual membership meeting, Roosevelt Hotel, New Orleans.
15-17 American Institute of Electrical Engineers, fifth electrical conference of the petroleum industry, Baker Hotel, Dallas.
18 Natural Gasoline Association of America, Rocky Mountain regional meeting, Gladstone Hotel, Casper, Wyo.
18-20 Rocky Mountain Association of Geologists, field trip, Maroon basin, registration, Glenwood Springs, Colo.
21-24 American Society of Mechanical Engineers, petroleum division, mechanical engineering conference, Cosmopolitan Hotel, Denver.
22-24 American Institute of Chemical En-

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F-M Jackpower does the job better for less cost, less maintenance!

Whether you pump your well with gas or kilowatts, there is the just-right Fairbanks-Morse prime mover for the job. Today's Fairbanks-Morse engines are the result of the design and manufacturing experience of 70 years; today's Fairbanks-Morse motors have a similar tradition of half a century.

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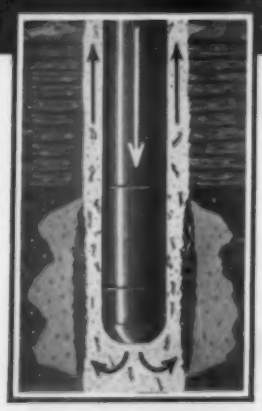

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gineers, national meeting, Hotel Utah, Salt Lake City.

24-25 Western Petroleum Refiners Association, Rocky Mountain regional technical-industrial relations meeting, Henning Hotel, Casper, Wyo.

24-25 National Association of Corrosion Engineers, San Joaquin Valley section, corrosion tour, Bakersfield, Calif.

25 Manufacturing Chemists' Association, Texas Chemical Council, chemical industry safety workshop, Shamrock Hilton Hotel, Houston.

25-26 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual meeting, Roosevelt Hotel, New Orleans.

25-27 Illinois State Geological Survey, biennial petroleum engineering conference, University of Illinois, Urbana.

29-Oct. 3 Society of Automotive Engineers, national aeronautic meeting, aeronautic production forum, and aircraft engineering display, The Ambassador, Los Angeles.

OCTOBER

1-2 Western Petroleum Refiners Association, third annual stream-pollution and waste-disposal conference, Lassen Hotel, Wichita.

1-3 American Association of Oilwell Drilling Contractors, eighteenth annual meeting, Adolphus and Baker Hotels, Dallas.

3 American Institute of Chemical Engineers, South Texas section, thirteenth annual technical meeting, Moody Center, Galveston, Tex.

5-8 Society of Petroleum Engineers of AIME, fall meeting, Houston.

5-8 National Association of Corrosion Engineers, northeast region, Somerset Hotel, Boston.

7-8 Texas Mid-Continent Oil and Gas Association, annual meeting, Statler-Hilton Hotel, Dallas.

9-10 California Natural Gasoline Association, thirty-third annual fall meeting, Huntington - Sheraton Hotel, Pasadena, Calif.

10-12 Tri-State Oil Show, Roberts Municipal Stadium, Evansville, Ind.

12-18 OIL PROGRESS WEEK.

13-15 American Gas Association, annual convention, Atlantic City, N. J.

13-15 American Society of Mechanical Engineers, American Society of Lubricating Engineers, conference on lubrication, Statler Hotel, Los Angeles.

13-16 Society of Exploration Geophysicists, annual meeting, Hotel Gunter, San Antonio, Tex.

13-17 American Society of Civil Engineers, annual convention, Hotel Statler, New York.

15-16 South Dakota Independent Oil Men's Association, convention, Sheraton-Johnson Hotel, Rapid City.

15-16 University of Kansas, Southwest Kansas Center, sixth annual Gas Measurements Institute, Liberal, Kans.

15-17 National Association of Corrosion Engineers, north central region, Cincinnati.

16-17 Society of Petroleum Engineers of AIME, Southern California petroleum section, Biltmore Hotel, Los Angeles.

16-18 New Mexico Geological Society, Arizona Geological Society, ninth annual field conference, Black Mesa basin, registration Gallup, N. M., Oct. 15.

16-19 Permian Basin Oil Show, Odessa.

19-21 National Association of Oil Equip-

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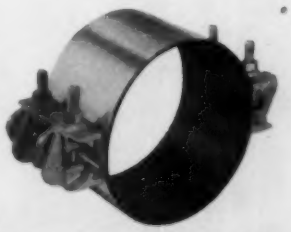
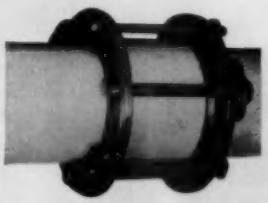
For repairing pitholes and longitudinal splits in steel pipe. **Split Repair Clamp Style 79-B.**

For repairing leaks in high pressure steel lines. **Permaclamp Style 75 (type 1).**



For repairing full breaks or holes in Asbestos-Cement pipe. **All-Around Repair Clamp Style 360.**



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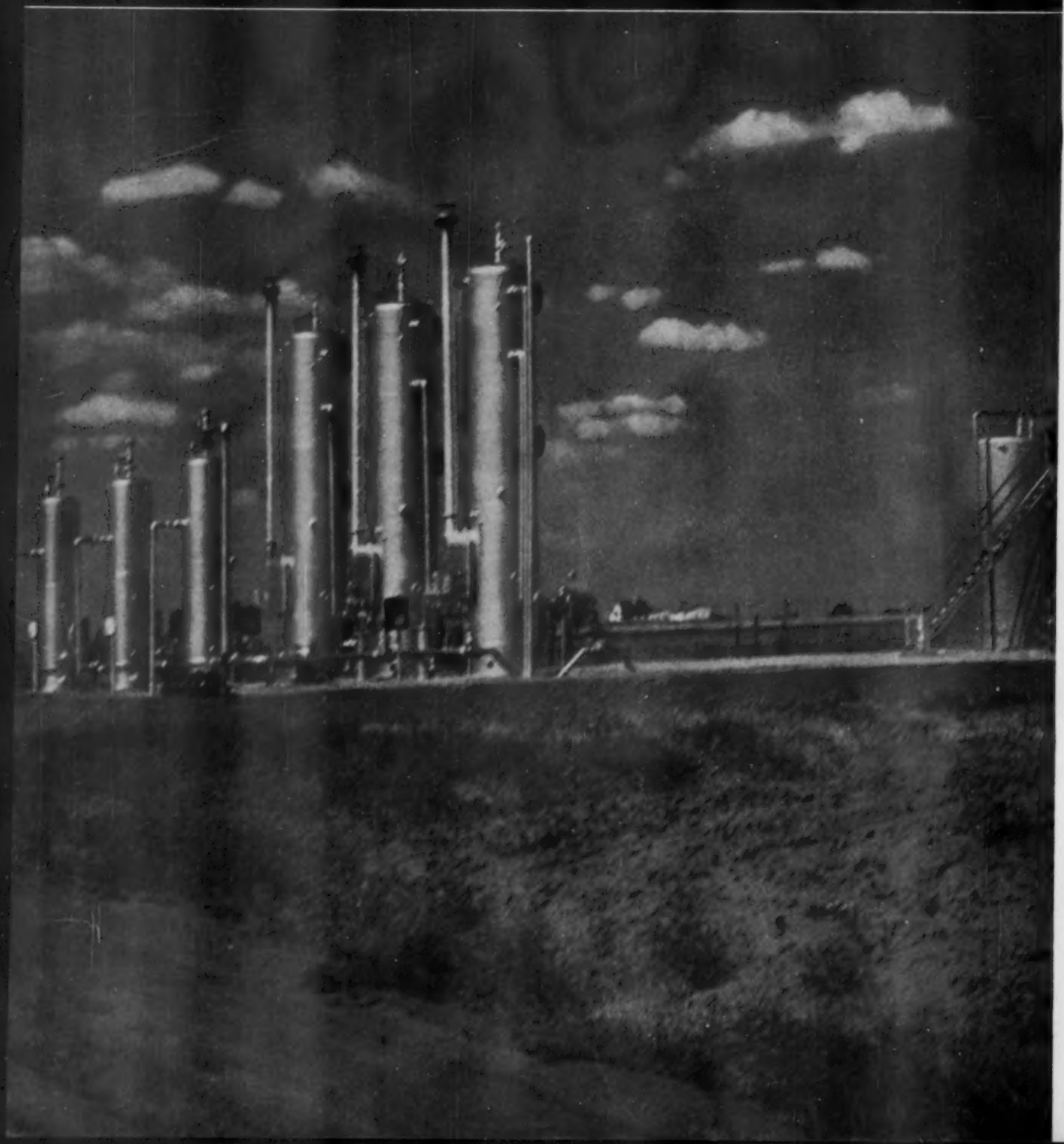

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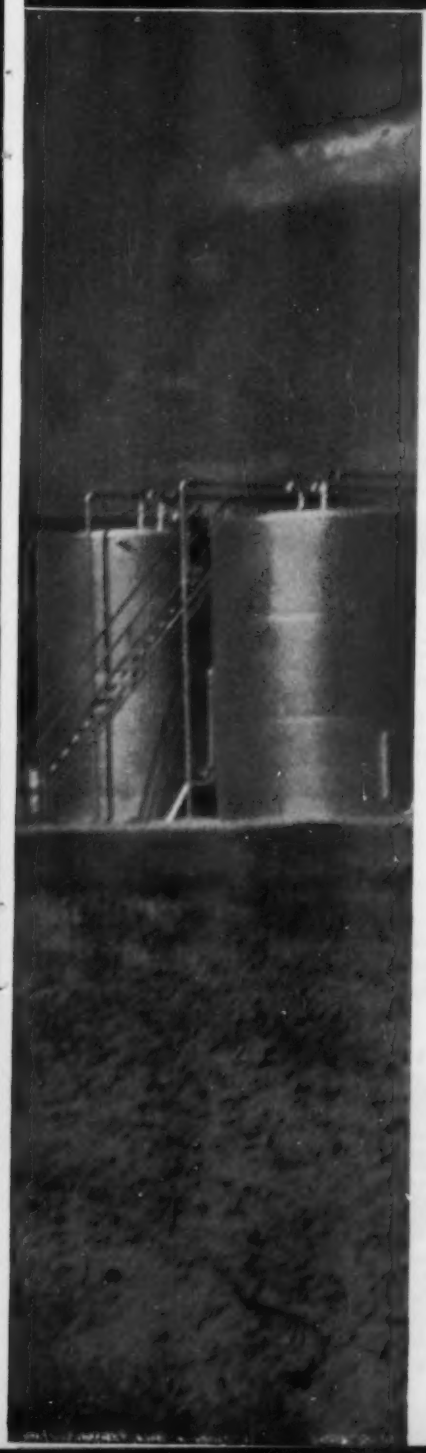

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ment Jobbers, annual convention and trade show, Hotel Adolphus, Dallas.

20-21 Instrument Society of America, national rubber and plastics instrumentation symposium, Akron, Ohio.

20-24 National Association of Corrosion Engineers, south central region, Roosevelt Hotel, New Orleans.

20-24 National Safety Council, forty-sixth National Safety Congress, Conrad Hilton Hotel, Chicago.

22-23 National Association of Corrosion Engineers, western region, corrosion control course, U. S. Grant Hotel, San Diego, Calif.

22-25 Southwestern Federation of Geological Societies, regional meeting, Mineral Wells, Tex.

22-24 Society of Automotive Engineers, national diesel engine meeting, Lord Baltimore Hotel, Baltimore.

23-24 Rocky Mountain Oil and Gas Association, annual fall meeting, Town House Motel, Omaha.

23-24 Western Petroleum Refiners Association, refining technology and industrial relations meeting, Rufus Garrett Hotel, El Dorado, Ark.

26-28 Gulf Coast Association of Geological Societies, Driscoll Hotel, Corpus Christi, Tex.

27-28 Independent Petroleum Association of America, annual meeting, Statler-Hilton Hotel, Dallas.

26-31 American Institute of Electrical Engineers, general meeting, Pittsburgh.

31 Natural Gasoline Association of America, Southern regional meeting, Carlton Hotel, Tyler, Tex.

NOVEMBER

5-6 Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa.

6-7 American Association of Petroleum Geologists, Pacific section annual meeting, Los Angeles.

6-7 Louisiana Polytechnic Institute. School of Engineering, seventh annual instrumentation conference, Ruston, La.

10 Transportation Club of the Petroleum Industry, annual meeting, Bismarck Hotel, Chicago.

10-13 American Petroleum Institute, thirty-eighth annual meeting, Conrad Hilton, Palmer House, and Congress hotels, Chicago.

18-20 Ninth National Conference on Standards, Hotel Roosevelt, New York.

18-20 National Conference on Air Pollution, Sheraton-Park Hotel, Washington, D. C.

20-21 American Society of Civil Engineers, structural division and Kansas City section, conference on electronic computation, Kansas City.

21 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

30-Dec. 5 American Society of Mechanical Engineers, annual meeting, Statler and Sheraton-McAlpin hotels, New York.

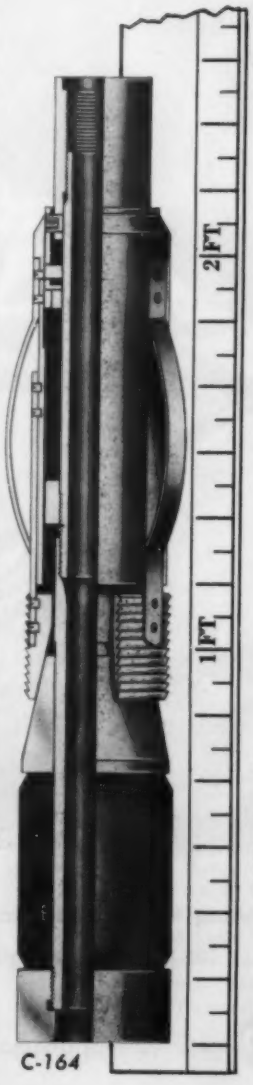
DECEMBER

1-3 Interstate Oil Compact Commission, annual meeting, Kansas City.

7-10 American Institute of Chemical Engineers, annual meeting, Netherland Plaza Hotel, Cincinnati.

9-13 National Association of Corrosion Engineers, University of Illinois, biennial short course on cathodic protection.

We had to copy



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No Packer we know of can be retrieved more easily and successfully — because only the Larkin of Butler Midget Packer has a left hand back-off connection in the Packer middle. If normal release is not possible, it can be backed-off. This assures positive removal of the top half of the Packer, including the slips.

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TULSA, OKLAHOMA

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JOURNALLY SPEAKING

Running Out of Oil

IN THUMBING through the history of the oil industry—which we have been doing for the past several months—we concluded that a fair-sized book could be written about all the predictions that this country is running out of oil.

Such dire prophecies have been made with great regularity almost continuously during oil's entire century. They began within a few weeks after Drake's first well came in. Pessimists were sure that it was just a freak flash in the pan.

Oil men have always scoffed at such predictions publicly, but just the same the fear of a shortage seems to have lurked in the back of their minds and colored their thinking.

For example, a magazine writer made a trip through the producing area in 1883, when the industry was less than 25 years old, and he must have found oil men talking about the possibility of running out of oil. For he wrote:

"What is the future of the petroleum business? With a productive territory virtually confined to a few small strips and spots in six counties in western Pennsylvania and New York, and an inexorable law of rapid exhaustion applying to all wells, the time would seem to be close at hand when this great blessing, the cheap light of the whole civilized world, would fail.

"Still, the history of the business in the short period since it began has been one of constant expansion. New fields have invariably been discovered when the yield of the old ones began to decline. Oil men have confidence that there is plenty of undiscovered territory yet to be found. Providence, they say, would not bestow so great a gift upon mankind to withdraw it when its use had become universal and the need of the human race for its benefits the greatest.

"Scientists may say that this view is based on an optimistic or pietistic theory of the universe that will not stand investigation. So far as the great stores of fuel and light, the coal and the petroleum, are concerned, it has, however, held good thus far. They have not failed. If the oil of the rock is destined to run dry, the chemists will perhaps be ready, by the time it is exhausted, to produce a cheap illuminator from water."

Well, the "chemists" (more properly the electrical engineers) did produce a cheap illuminator from water—in the form of hydroelectricity and the incandescent bulb.

But that didn't eliminate the need for oil, because at about the same time that kerosine began to go into eclipse as a source of light the world discovered that it needed more oil than ever for propulsion and power.

And that realization, which came to a head about the time of World War I, evoked a whole rash of running-out-of-oil predictions from prominent scientists and officials. Even the oil men were scared—so scared that within a couple of years they began finding so much more oil that they have been practically drowning in the surplus ever since.

Somewhere we once saw a chart listing the more prominent predictions of an oil shortage, and on it was plotted the curve of steadily rising discovery and production. The purpose of this chart was to deride the pessimists and to pooh-pooh the idea that we need to worry about future supplies.

But in contemplation we have concluded that at least a moderate amount of worry is a good thing. The oil industry might never have amounted to a hill of beans if it hadn't been for the lurking fear that, by golly, we just might run out of oil if we don't get a hump on.

Glancing back over the century it seems a fair generalization that the industry didn't make much progress during periods when there was so much oil around that everybody was complacent about future supplies. But when the shortage alarm was ringing loud, then was when the industry made its greatest strides in such things as geophysics, reservoir control, and refining technology.

Apparently the industry does best when it's a little lean and hungry for supplies. If so, shortage predictions serve a useful purpose in forcing the industry to prove them false. As we said, the history of these shortage scares and their effect on the industry could make a fair-sized book.

—Henry D. Ralph

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Around the world they search for oil capital

THERE is a common denominator and a common lesson in situations now involving the petroleum industry in such seemingly unrelated places as Argentina, the Middle East, Mexico, and the United States.

This is the problem of obtaining capital for development, and a means of rewarding capital without giving it free rein to make exorbitant profits or exploit other interests.

This problem, of course, is as old as civilization. But its current manifestation in connection with oil and gas in at least four corners of the globe simultaneously is an instructive coincidence.

THERE WERE RIOTS in Mexico City last week in protest against a suggested increase in the price of gasoline which would entail higher bus and taxi fares. The increase is being considered by Pemex, the government oil monopoly, to alleviate its chronic lack of capital.

Pemex operates on the theory that its profits should go to workers in the form of good wages and to consumers in the form of low prices. This is fine unless these groups exploit capital—which seems to be the case. Unless Pemex can increase its earnings it may have great difficulty getting either local or foreign capital.

Argentina for years virtually embargoed foreign capital from its petroleum industry. But it was not able to offer rewards sufficient to build up from its own resources the capital needed for expansion.

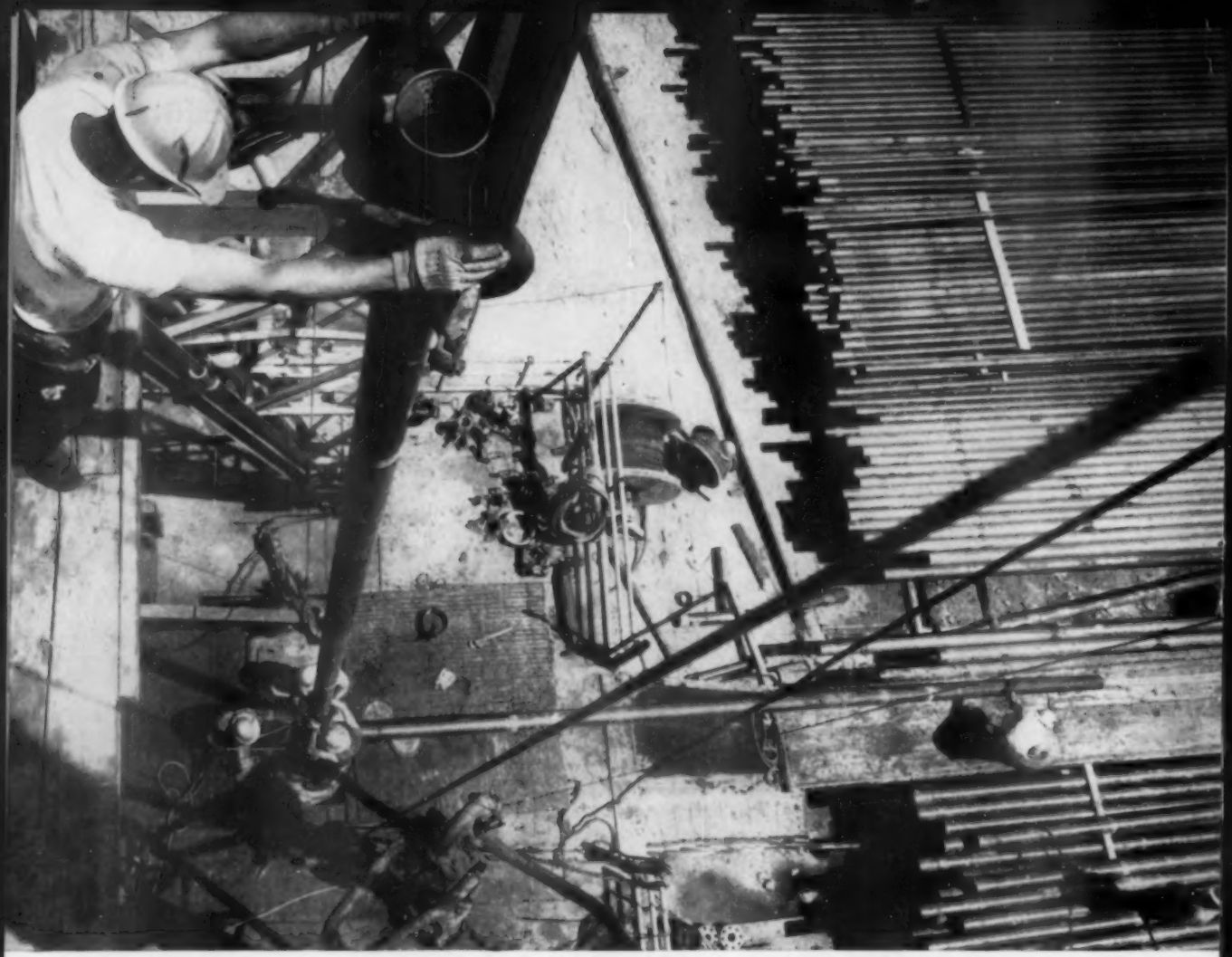
Now Argentina appears to be relenting to a degree. In limited projects it is offering foreign capital a fair chance to make a fair return, but with safeguards against getting out of bounds.

The Arab nations, too, have ideas for getting for themselves a greater share of the profits from the development of their oil. They profess to realize that the developers must also be left with a fair share or else there will be no further development.

But drawing a fine line between reasonable and unreasonable earnings of capital is well-nigh impossible, particularly when projected into the future in an enterprise involving such uncertainties as petroleum.

WHAT HAS THIS TO DO with the United States? A parallel lies in natural-gas production. The Federal Power Commission and the courts are struggling to find a mathematical formula that will give capital just barely enough return to induce exploration and not one penny more that would otherwise go to consumers.

Thus around the world nations are trying to find ways of getting capital for oil without letting the investors get rich. They all have before them plenty of examples to demonstrate that unless the margin of doubt is favorable, capital will stay in the sock and oil and gas will stay in the ground.



Running Casing calls for teamwork between the man on the stabbing board and the crew below.

Here's Where It Started...

Pittsburgh Steel's oil country goods still being supplied to oil, gas wells in area where world's first well was drilled

Experience pays off in oil and gas fields everywhere. But in Pennsylvania, oil and gas men log their experience by generations instead of by years.

And well they might. Col. Edwin Drake started it all in the Keystone State back in 1859. Since then, Pennsylvania has built a reputation as producer of one of the world's finest oils.

Today, with secondary recovery methods giving new life to old oil wells, the venerable oil industry shares a new importance with the continuing production of natural gas.

Drilling for gas in Pennsylvania's rugged hills is no job for amateurs. Once you've solved the problem of moving your rig and equipment across rugged hills and valleys, you've still got scores of problems to cope with.

• **Need Finest Materials**—One is gas pressure. Producers know gas pressure is something you deal with right the FIRST time. That's why they demand the finest in oil country goods.

That's one big reason why the independent distributor serving this pioneer Bradford Field offers his customers seamless drill pipe, casing and tubing produced by Pittsburgh Steel Co.

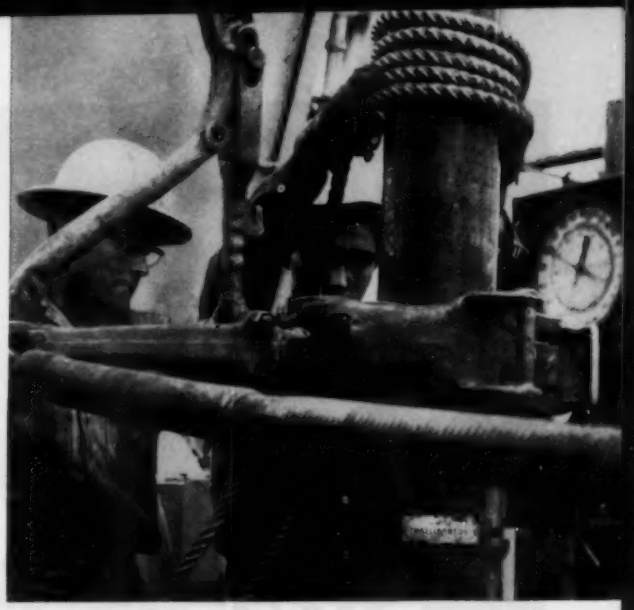
Now well into his second half century of existence, this Mr. Independent started back in 1907 when the oil and gas fields of Western Pennsylvania were really booming.

Today he's still in business in that area and has extended his operations westward to follow the new discoveries. Now his 15 branches and five shops do a good job of covering the country's oil and gas fields.

With this backlog of experience, Mr. Independent knows materials. He has a vast store of knowledge to share with customers.

He handles oil country goods made by Pittsburgh Steel Co. because they

Inspecting Casing: l. to r., Dale Croasmun, engineer for Manufacturers Light and Heat Co.; Mark Wagner, independent distributor's representative; Peter E. Douylliez, Pittsburgh Steel field engineer; and S. M. McMahon of Pittsburgh Steel.



Spinning In The Casing. The run has just started and roughnecks are threading the second joint into the first. More than 200 joints of Pittsburgh Steel Co. casing were used on this hole. Total depth was 7,242 ft.

help him meet the credo he established for his company. That credo is to offer "only the highest quality oil and gas well supplies and to give complete customer satisfaction through the best possible service."

The quality of the product he handles was demonstrated on the gas well pictured here in the Bradford Field where casing is all-important.

Because natural gas roars up the casing under pressures ranging from 2,000 to more than 4,000 pounds per square inch, casing is carefully tested in the hole before drilling continues on to pay.

• **Casing Passes Test**—On this well after drilling to 7,200 feet, operations were halted an estimated 40 feet from pay. Then Pittsburgh Steel's seven-inch J55 seamless casing was run into the 7,200-foot hole, cemented and tested.

This casing was run between noon and midnight without any delays caused by improper or damaged threads or other casing imperfections.

Behind that success was an effective combination of mill and distributor. The casing was of high, uniform quality because the skilled steelmakers and the experienced men in the Pittsburgh Steel pipe mills took the pains necessary to make sure that *every* joint met specifications.

The distributor had a big role, too.

Service rendered by the independent distributor in the Bradford Field is typical. In this area, not far from the world's first commercial oil well, independent distributors have built a solid reputation for good products, dependable service and a willingness to do more than they are asked to do.

In Western Pennsylvania's older fields, for example, secondary recovery methods have been developed to a fine art to help give new life to old wells.

Because the Mr. Independent who serves oil and gas men in the Bradford area has worked on hundreds of secondary recovery installations, he and his men have learned a lot which they're more than eager to pass on to drillers and well owners.

• **Something Special**—Like all the independent distributors listed here, this Mr. Independent has something special to offer oil and gas men . . . dependable casing, tubing and drill pipe that is supplied and serviced by men who have a real stake in the welfare of their customers.

These independents feel they are allies to the men who buy their oil country goods. The independent distributor is just that—independent. He sinks or swims according to how well his customers do.

So, tie in with Mr. Independent. He's really working for you. When you need oil country goods, pick up your phone and call the Pittsburgh Steel Co. distributor nearest you.

Distributor Home Offices

Bradford Supply Company
Bradford, Pennsylvania

Buckeye Supply Company
Zanesville, Ohio

Cardwell Manufacturing Co.
Wichita, Kansas

C. W. Cotton Supply Company
Tulsa 5, Oklahoma

Franklin Supply Company
Chicago 5, Illinois

Houston Oil Field Material Co.
Houston, Texas

Industrial Supply Company
Wichita Falls, Texas

Iverson Supply Company
Tulsa, Oklahoma

Longhorn Supply Co., Inc.
Houston 14, Texas

Lucey Export Corporation
New York 7, New York

Lucey Products Corporation
Tulsa 19, Oklahoma

McJunkin Corporation
Charleston 22, West Virginia

Midland Supply Company
Wichita 7, Kansas

Mountain Iron & Supply Co.
Wichita 2, Kansas

Murray Brooks, Incorporated
Lake Charles, Louisiana

The Producers Supply & Tool Co.
Fort Worth 2, Texas

Production & Refining Equipment Company
Odessa, Texas

Sandy Supply Company
Wooster, Ohio

Southwest Supply Company
Pittsburgh, Pennsylvania

Superior Iron Works & Supply Co.
Shreveport, Louisiana

Western Supply Company
Tulsa 1, Oklahoma

Pittsburgh Steel Company

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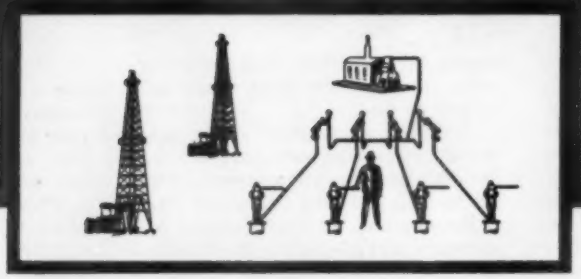

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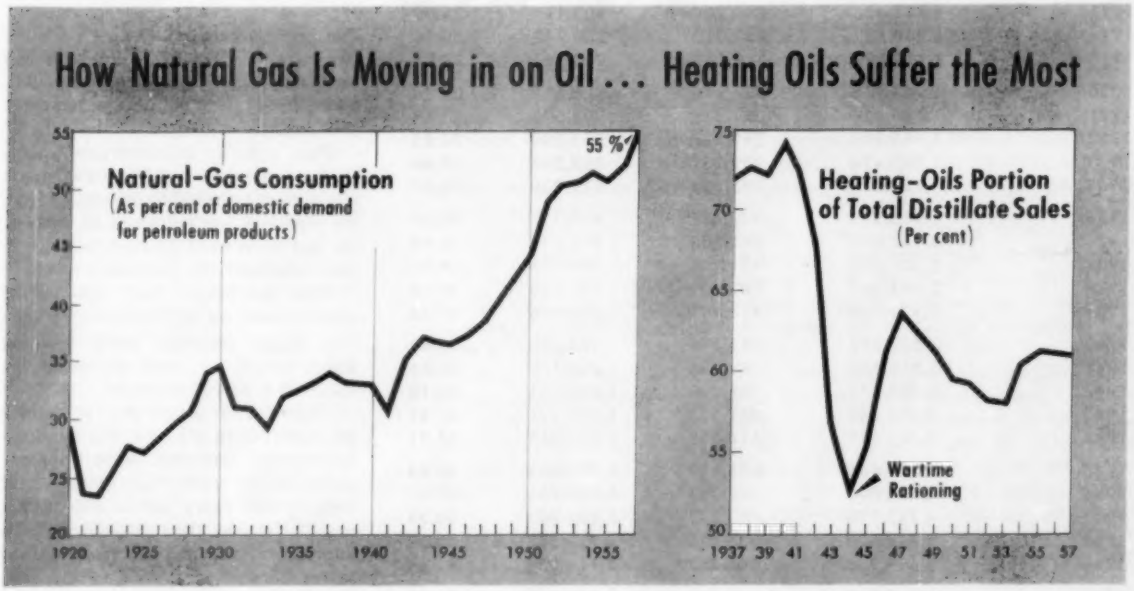


Gas to Keep Gobbling Up Oil Markets

NATURAL GAS has arrived as a giant fuel rival of oil.

What's more, it shows every sign of dominating the home-heating and industrial-fuel market within the next decade.

Few oil men realize the extent of this sweeping development which has seen natural gas:

... **Grow faster** than oil.

... **Shove oil product** aside in the market.

... **Depress the prices** of distillates and residuals and ultimately the price of crude itself.

Economists now predict that in America's expanding future energy needs there will be room for growth by both petroleum products and natural gas. But they expect gains by natural gas to be more spectacular.

Rate of growth . . . Natural gas has made its greatest gains in the years since World War II.

In 1946 marketed gas equaled 37.47% of the total domestic demand for all petroleum products. By 1957 gas sales had grown so much they equaled 55.48% of petroleum demand.

This growth appears even greater when volumes are considered.

Gas sales in 1946 slightly exceeded 4 trillion cubic feet; in 1957 they passed 10.6 trillion cubic feet.

In crude equivalents, this meant gas in 1946 did the work of 671 million barrels of oil and in 1957 replaced 1.7 billion barrels of crude. In that same year total domestic petroleum demand topped only slightly 3.2 billion barrels.

During the same period, domestic petroleum demand also enjoyed a good gain for each of the 12 years. This demand rose from 1.8 billion barrels in 1946 to the 3.2 billion barrels in 1957.

These gains for petroleum tended to obscure from oil men what really was happening: While oil demand nearly doubled in 12 years, gas sales nearly trebled.

The real pinch . . . Gas has made its best showing in space heating and stove-fuel fields, areas formerly dominated by the light heating oils.

The heating oils have held about the same percentage of the total domestic distillate market despite more than doubling volume of sales.

Heating-oil volumes jumped from 148 million barrels in 1946 to 377 million barrels last year. But in 1946 these oils represented 61.82% of the market and in 1957 61.08%, a fractional loss in 12 years.

To economists this meant that the heating oils merely held their own in the expanding energy market while natural gas made rapid gains.

Natural-gas gains also have tended to put a ceiling on expansion of the residual-oil market.

Residual sales in the last 5 years have dropped slightly—from 564 million barrels in 1953 to 543 million barrels in 1957. Sharp drops were experienced, however, in residual going to heating and industrial use, areas where gas has become competitive.

What gas competition has meant to petroleum is more evident when the volumes of gas sales are compared with total sales of distillate and residual.

For the last 5 years gas has outstripped the combined sales of these products.

In 1953, the heating and burning oils totaled 1,053,573,000 bbl. while gas sales converted to barrels equaled

Natural Gas: Volume Up, Share of Market Way Up

	Marketed production of natural gas (M.M.c.f.)	Crude equivalent of gas (1,000 bbl.)	Domestic demand for products (1,000 bbl.)	Gas per cent of product demand
1925	1,188,571	198,099	727,178	27.24
1926	1,313,019	218,841	780,755	28.03
1927	1,445,428	240,909	803,177	29.99
1928	1,568,139	261,362	860,241	30.38
1929	1,917,693	319,622	940,581	33.98
1930	1,943,421	323,910	926,624	34.96
1931	1,686,436	281,078	902,593	31.14
1932	1,555,990	259,337	835,230	31.05
1933	1,555,474	259,251	868,200	29.86
1934	1,770,721	295,126	919,838	32.08
1935	1,916,595	319,439	983,317	32.49
1936	2,167,802	361,308	1,092,379	33.08
1937	2,407,620	401,278	1,169,205	34.32
1938	2,295,562	382,601	1,136,705	33.66
1939	2,476,756	412,801	1,230,486	33.55
1940	2,660,222	443,379	1,326,620	33.42
1941	2,812,658	469,786	1,485,779	31.62
1942	3,053,475	508,923	1,449,908	35.10
1943	3,414,689	569,126	1,521,426	37.41
1944	3,711,039	618,519	1,671,263	37.01
1945	3,918,686	653,127	1,772,685	36.84
1946	4,030,605	671,781	1,792,786	37.47
1947	4,582,173	763,711	1,989,803	38.38
1948	5,148,020	858,020	2,113,678	40.59
1949	5,419,736	903,307	2,118,250	42.64
1950	6,282,060	1,047,031	2,375,057	44.08
1951	7,457,359	1,242,918	2,569,827	48.37
1952	8,013,457	1,335,603	2,664,407	50.13
1953	8,396,916	1,399,514	2,775,321	50.43
1954	8,742,546	1,457,120	2,832,424	51.44
1955	9,405,351	1,567,590	3,087,775	50.77
1956	10,081,923	1,680,354	3,213,187	52.30
1957	10,688,000	1,781,369	3,210,893	55.48

Heating Oils: Volume Up, Share of Market Down

	No. 2 heating oils	No. 1 as range oil	Total heating	Total U. S. distillate	Per cent heating	Per cent diesel
1937	81,235	2,747	83,982	116,644	72.00	18.8
1938	82,388	2,902	85,289	117,411	72.64	18.1
1939	97,131	3,220	100,351	138,570	72.42	17.2
1940	115,533	3,977	119,510	160,652	74.39	15.3
1941	120,908	4,449	125,357	173,339	72.32	15.8
1942	121,506	4,978	126,484	186,813	67.71	18.0
1943	112,581	5,876	118,457	207,712	57.03	23.7
1944	111,729	6,619	118,348	223,872	52.86	31.4
1945	121,342	7,481	128,823	231,625	55.62	28.7
1946	139,637	8,459	148,096	239,550	61.82	22.6
1947	178,359	11,632	189,991	298,014	63.75	23.4
1948	200,024	13,534	213,558	341,973	62.45	25.0
1949	190,387	12,279	202,666	329,196	61.56	26.7
1950	220,947	14,793	235,740	395,306	59.63	26.5
1951	249,758	16,224	265,982	448,908	59.25	27.09
1952	263,379	15,947	279,326	479,210	58.29	29.03
1953	267,498	15,602	283,100	488,844	57.91	30.62
1954	304,540	15,557	320,097	526,245	60.83	29.13
1955	339,215	17,374	356,589	581,127	61.36	29.12
1956	359,827	17,435	377,262	615,775	61.27	29.37
1957	360,212	16,832	377,044	617,275	61.08	29.72

1,399,514,000 bbl. That's a margin in favor of gas of 345.9 million barrels.

But 4 years later this margin was even greater. Combined oil sales were 1,161,225,000 bbl. in 1957 and gas equivalent was 1,781,369,000 bbl., a margin of 620 million barrels for gas.

The price picture . . . One of the most attractive features of natural gas has been its cheap price compared with other fuels available to homeowners and industry.

This, plus its clean-burning qualities and ease of handling, has made gas almost unbeatable in areas where big pipelines can deliver it in volume. Oil has been hard pressed to hold its own wherever the gas mains reach.

This low-priced fuel has put a double pinch on oil producers—it has:

. . . Kept distillate and residual prices lower, and thus depressed the value of a barrel of crude.

There's little doubt that if natural gas hadn't been available the tremendous energy demands since the war would have made the heating and burning oils more scarce and higher priced. Instead, their prices have been kept down, and this has meant lower prices all the way back to the producer.

. . . Failed to bear its share of costs. The price of gas has remained too low for the rising costs involved in finding and producing it.

Oil producers usually are also gas producers, and gas often is found in the search for oil. So it's important to oil producers that gas bear its fair share of costs.

There's great confusion in the industry over the exact cost of gas, but most oil men agree that prices received in the field often don't give a fair return.

Besides affecting his prices, gas has restricted the oil producer's outlet for his crude.

Refiners have been forced to change their operations. They run their plants to produce a minimum of the heavier products and a maximum yield of gasoline, the big money product which natural gas hasn't affected.

The result is that the refiner needs to process less crude to serve his markets than would be needed if demand were brisk for the heating and burning oils (OGJ, Dec. 30, 1957, p. 110).

The price advantage enjoyed by gas, however, may diminish in the future. Some marketers predict that gas prices will increase somewhat faster than the oil prices (OGJ, May 26, p. 65), and there will be room for both fuels in the energy market generated by the American economy.

Two Firms Combine

in joint oil, gas search of western Canadian lands.

D. D. FELDMAN Oil & Gas, Dallas independent operator, and Ceepee Oil Co., Ltd., have joined forces to conduct oil and gas exploration in most of western Canada.

Ceepee, a wholly owned subsidiary of Wintershall, A. G. of Kassel, Germany, has Canadian offices in Regina, Sask. Feldman's western Canada exploration office is at Calgary, Alta.

Ceepee has extensive undeveloped acreage in Saskatchewan and currently is evaluating these holdings. Feldman has substantial production in the Gull Lake, Catuar, and successful fields in Saskatchewan.

The exploration agreement between the two firms provides for joint operation in Alberta, British Columbia, and the Northwest and Yukon territories. Neither of the firms, with the exception of a small Feldman lease in Alberta, has acreage or production in these areas. The two firms will continue as competitors in Saskatchewan.

Terms of the agreement briefly call for Feldman to supply exploration data it has accumulated while Ceepee contributes the capital. A Feldman executive in Dallas said Ceepee will provide the funds for leasing, geophysical work, and drilling through completion of the first well on a prospect.

Hess Settles With Teamsters

A 9-WEEK-OLD strike of about 200 drivers and plant workers at three New York Harbor terminals of Hess, Inc. ended last week with signing of a new 2-year contract.

Terms of the settlement included a 10-cent hourly wage increase the first year and another 10-cent increase in the second year. In addition, a 4 to 5-cent increase in fringe benefits was provided over the 2-year period.

The strike was called by Teamsters Local 469 of Perth Amboy, N. J., and Federal Labor Union Local 22026. The stoppage had halted about 100 Hess trucks.

Teamster and oil company negotiations in the Chicago area, meanwhile, are heading to a showdown later this week. Bargaining sessions are scheduled to be resumed Friday. They have been deadlocked for more than 2 months over demand by drivers for a 25-cent wage increase. Representatives of oil firms marketing in the Chicago region thus far have been adamant against any pay raises.

watching WASHINGTON

Bertram F. Linz

• Oil pipeline traffic and revenue drops

ANOTHER MEASURE of the effect of the recession on the oil industry is now available.

Total traffic of the oil-carrying pipelines dropped from a record high of 1,170,000,000 bbl. in the first quarter of 1957 to 992,900,000 bbl. in the second quarter this year, according to reports filed with the Interstate Commerce Commission.

Transportation revenue fell in the same period from $176.6 million to $156.2 million, although there are now two more pipelines operating.

Comparing the second quarters of 1958 and 1957, only 24 of the 69 reporting lines showed an increase in traffic volume. And 7 of these 24 showed a drop in revenue. Altogether 38 of the 69 companies had lower revenues.

Most of the increases in traffic were shown by the smaller lines. The big lines accounted for most of the losses. For example, the top carrier, Gulf Refining Co., dropped from 86.3 million barrels in the first quarter of 1957 to 61 million barrels in the second quarter of 1958.

The best showing among the larger lines was made by Sinclair Pipe Line Co. Volume the first quarter of 1958 was 5.5 million barrels below last year's first quarter of 59.9 million barrels, but bounced back to a good 60 million barrels the second quarter this year.

• Tanker business is better but still low

ONE-SIXTH of the privately owned U. S. tanker fleet was laid up on August 1. But conditions are improving, Maritime Administration officials say.

Only 38 tankers were idle because of business conditions last month. That was better than the 46 inactive for lack of work on July 1.

Another 17 vessels were idle for repair or conversion. And all of the Government's 55 tankers also were laid up.

Building for the future goes along steadily, despite the current setback. Shipyards have contracts for 61 new oil carriers and the conversion of 9 others.

Construction is actively under way on 28 vessels and 8 of the conversions.

Two new tankers and one converted tanker were delivered in July, adding 82,650 dw. tons to the 5,838,210 dw. tons at which the U. S. fleet stood on July 1.

• Factual study of depletion would help

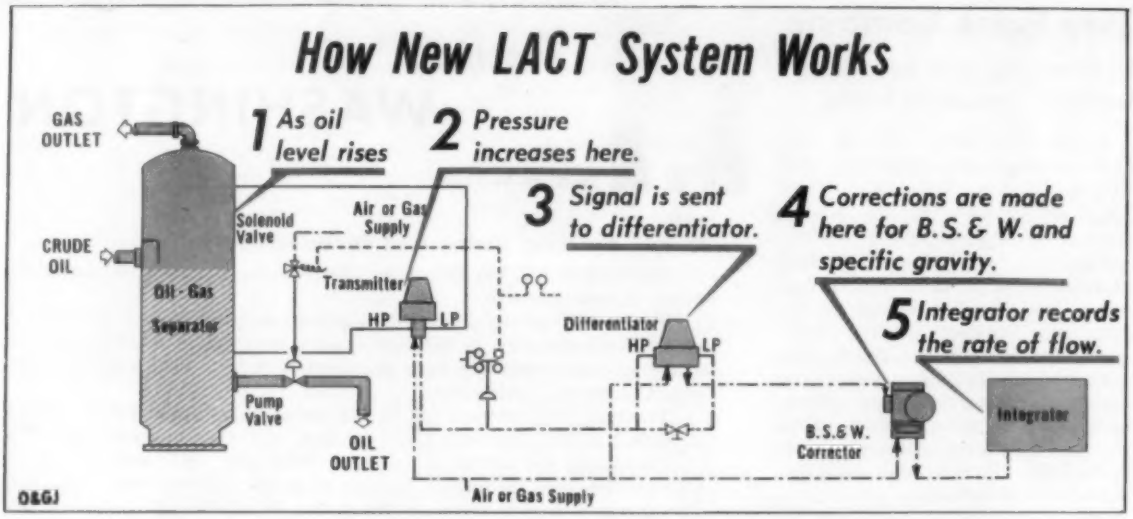
DOMESTIC OIL producers will welcome a factual study of their depletion allowance if Congress wants to go into the matter next year.

They are confident that an objective analysis would show that there is no water in the present 27½% rate.

Much of the criticism leveled at oil depletion has been based on its allowance on production abroad. Domestic producers argue that foreign operations have nothing to do with their situation. Treasury officials, for years, have supported the principle of depletion. They have repeatedly told Congress that before it makes any change in rates it should make a thorough study.

But through those years the department has evaded congressional requests for concrete recommendations of a proper rate. The excuse has always been that the matter is under study. Probably no other phase of taxation has been under study so long, with so little result.

There's a good chance that the next Congress may review the whole depletion setup. The treasury finally may come up with some suggestions. And politics will be less important after the elections.



Weight Measures Flow in New Unit

THE FIRST fluid-flow measuring device based on weight instead of volume has been developed by Fischer & Porter Co., Hatboro, Pa.

Designed for use in LACT systems, the new equipment:

. . . **Measures oil** on a weight basis, eliminating errors due to temperature changes, foaming, etc.

. . . **Can be adapted** to existing separators, whether designed for metering or not.

. . . **Gives a direct** reading in net oil, with automatic correction for b.s. and w.

. . . **Has no direct** contact with crude, eliminating corrosion or erosion problems.

. . . **Has a pulse output** that permits its use with punch or print-tape recording instruments.

Twelve of the units already have been shipped to Venezuela for use by Creole Petroleum Corp.

How it works . . . The basic principle of operation is that as the height of a column of fluid increases, the pressure at the bottom also increases.

The difference in the pressures at the top of a separator (above the oil level) and at the bottom of the oil column is determined by the height of the oil. This difference is measured by a differential pressure transmitter.

The transmitter uses an outside source of air or gas to send a signal. The signal is proportional to the oil level in the separator. When the dump valve is closed, the oil level rises and the signal increases. When the valve is open, the level is lowered and the signal decreases.

The rate of rise of the oil level and the rate of increase in the signal are direct indications of the rate of oil production. This oil production rate is measured by a second differential pressure transmitter.

The signal sent by this transmitter is proportional to the rate of crude going into the separator. Its signal is fed to an integrator where the results are recorded in barrels per day.

The signal is corrected on its way to the integrator for b.s. and w. and specific gravity. The magnitude of the correcting signal can be set manually where the properties of the crude remain constant, or automatic correction can be supplied.

Automatic dump . . . When the signal from the first transmitter reaches a preset magnitude, the separator is emptied by a solenoid-operated dump valve, which is set off by a signal from a pressure switch.

At the same time, the signal being fed to the receiver is locked in by another solenoid valve. This provides the receiver with a continuous rate indication during the dump cycle.

Accessory equipment . . . A number of optional features can be included in the metering system to adapt it to several types of recording techniques.

One is an electric counter with a manual reset feature. This permits the operator to make periodic short-time production tests from a single well.

Also, a continuous recorder using either a circular or strip chart can be used by tapping into the pneumatic signal coming into the indicating receiver. This provides a continuous record of the crude flow.

The mechanical counter simultaneously sends a signal for a given increment of flow, which makes the unit suitable for use with well-testing equipment. These signals are used to operate test and production-operation recorders for the automatic programming and testing of wells.

Alternate system . . . Weight also is the primary measurement used in a second system developed by Fischer & Porter. It records the number of dumps.

The separator liquid level is measured the same way in this dump-type system, and a signal is transmitted to a pressure switch. The dump valve is opened and closed on signal from the pressure switch.

Each time the dump valve opens, a counter is put into action, recording the number of dumps. A clock is incorporated in the mechanism so that the flow rate can be determined.

Versatile use . . . Both systems can be applied to new separators or are available as conversion kits for use on existing separators.

All of the equipment, except the first transmitter, is located in a weatherproof instrument case. All elecrtrical contacts are explosion-proof or sparkless. The system can use gas or air regulated to 20 psi.

Changing units between separators of different dimensions can be accomplished by a single gear replacement, so that it continues to give direct readings in barrels per day.

Corrosive crude or sand in the crude have no effect on the performance or life of the unit.

New Rules Under Study

. . . by Oklahoma oil men who generally like the changes. But specific opposition may develop in October hearings.

REACTION to proposed changes in Oklahoma's field rules generally have been favorable, but opposition to specific sections is expected to develop at public hearings next month.

Ferrill H. Rogers, conservation attorney for the Oklahoma Corporation Commission who drew up the proposed changes, reported most of the comments so far received from oil men by his office have been favorable.

Checks with individual Oklahoma-based oil companies turned up the same general feeling. Most oil companies, however, still have the proposals under study and have not yet determined what company policy will be toward them.

The large companies have turned the proposed new rules over to engineering departments where field men are checking them out carefully to see what effect they will have on field operations. Most of them expect to have representatives at the hearings in October.

The hearings . . . Exact dates of hearings to be held in Oklahoma City still have not been set.

Rogers said he tentatively had set aside October 6-8 for the sessions, but this conflicts with the Houston meeting of the Society of Petroleum Engineers of AIME. Many Oklahoma engineers have complained about the conflict. Rogers now is trying to arrange a later date.

The new rules generally aim at tightening up enforcement of conservation practices by putting more responsibility on operators themselves (OGJ, Aug. 11, p. 70).

Any controversy over the rules is expected to center on proposals to force common purchasers to take the legal allowable from their connections, to force purchasers to extend connections, and to change the allowable formula.

Other legislation . . . Commission officials, meanwhile, are drawing up a legislative program to implement the new rules.

Officials have held informal talks with members of the oil and gas committee of the Oklahoma Legislative Council. The upshot may be legislation next year to:

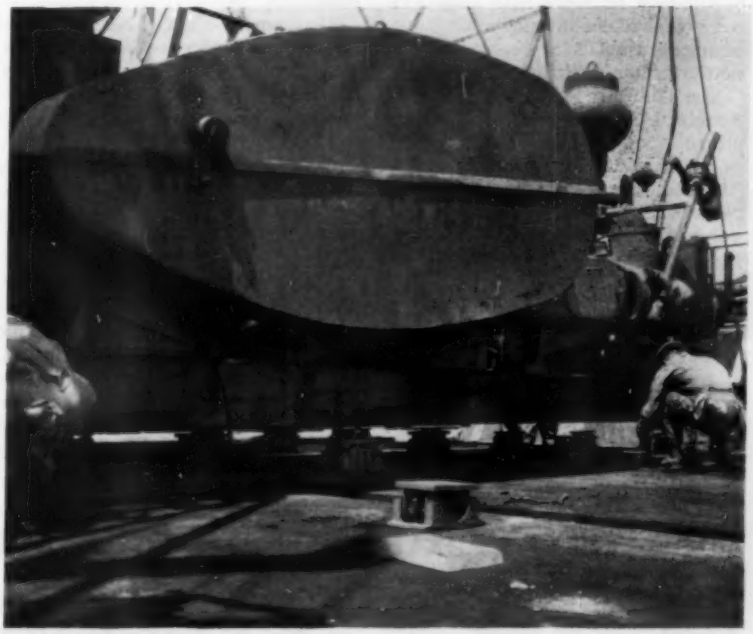
. . . Increase the production tax from one-eighth cent to one-fourth cent per barrel to provide additional funds to enlarge the state conservation staff. Oklahoma's department is the smallest of any major producing state.

. . . Create a fund to permit the commission to plug or replug abandoned wells where responsibility of former operators cannot be fixed. These wells have created hazards in metropolitan areas and endangered fresh-water strata in rural areas.

. . . Give the commission greater authority to regulate two-phase reservoirs. Trouble has arisen where wells originally were given large spacing for gas production and later oil production was discovered. Officials have expressed the feeling that the present maximum 40-acre spacing for oil wells less than 10,000 ft. should be increased.

. . . Give operators who need to run pipelines to dispose of salt water the right to eminent domain where the commission finds such a right is necessary for effective conservation.

. . . Extend commission authority over oil truckers to those who do not travel between incorporated towns. Only truckers doing business between towns now are subject to regulation.



Rig Muffled for Movie Makers

SOUNDPROOFED-drilling restrictions are something Los Angeles operators have learned to live with in recent years as residential drilling increased.

But Union Oil Co. of California recently ran into a drilling project requiring measures beyond anything used before.

The drill site was smack up against one of the highly sound and vibration-sensitive sound stages on the Paramount movie lot in downtown Hollywood.

So critical was the problem, Union used vibration isolators to minimize sound and vibrations from the mud pumps (photo). This was the first time such a tool had been used on a rig.

The usual double-layer, soundproof coating of vinyl glass cloth enclosed the derrick and all electric motors. Also, Union's research department rented an apartment across the street from the movie lot and equipped it with elaborate sound-detection devices, recording instruments, and a seismograph to make sure sounds and vibrations were kept to a minimum.

The engineers did an outstanding job resulting in a minimum of complaints from the movie people when the traditional "Quiet" was shouted and filming began. The geologists didn't do quite so well. The test turned out to be a dry hole.

Alaska's Gubik Gas Field Leases Lure

THE INTERIOR Department last week marked the start of competitive bidding for oil and gas leases in Alaska.

A half-dozen bidders competed for rights to develop the 16,000-acre Gubik gas field, which will supply a proposed pipeline to the Fairbanks area.

The field, part of the 25 million acres set aside for the use of the Navy 15 years ago, was split into 26 blocks for leasing. With the exception of three that are slightly smaller, all blocks are 640 acres in size.

Bonus offers ranged from $1.07 to $15.27 per acre.

Although no more than three bids were received on any single block, department officials expressed satisfaction over the offering.

The Gubik field lies east of Naval Petroleum Reserve No. 4. It is separated from the reserve by a 2-mile. buffer strip. It is north of the Brooks Mountain range, well above the Arctic circle. Development of Gubik will involve the most northern oil or gas operation on this continent.

Opening the Gubik bids was a first step in Sec. Fred A. Seaton's plan to encourage oil and gas development in Alaska.

In addition to the 26 sq. mile gas field, 4 million acres adjacent to it are being offered for noncompetitive leasing. Leasing on the Kenai Peninsula, suspended last May, was resumed late in July.

All leases will carry the higher rental and royalty rates provided by Congress last session to bring Alaskan charges in line with those in the continental United States.

Royalties on production will run from 12½ to 25% for oil and 12½ to 16⅔% for gas. The annual rental or minimum royalty will be $1 per acre.

The opening of Gubik field and the adjacent area should arouse "considerable interest" in Alaska's possibilities, Undersecretary Hatfield Chilson commented.

Department officials have long believed that the development of Gubik by private enterprise would aid greatly in expanding Alaska's economy.

At the same time, since a large portion of income from leases on public lands goes to the states in which they lie, the opening up of the formerly reserved lands will assist in giving Alaska "economic independence," they said.

Who bid . . . The major bidders for Gubik leases were the Alaska Propane Co., Inc., Fairbanks, and David C. Bintliff, Houston. Alaska Propane has the franchise for the sale and distribution of LPG in the Fairbanks area and has long been interested in finding a natural gas supply.

Bids also were received from Maurice MacGoodstein, Beverly Hills, Calif.; Louis L. Watson, Denver; Michel T. Halbouty, Houston; and Basic Materials, Inc., Santa Fe, N. M.

Four others submitted offers, but failed to describe the blocks bid upon sufficiently for identification.

Bonus offers for leases, on which the department will announce awards after study, were:

. . . **In Range 4E:** Block 2, southwest section: Bintliff, $8.06 per acre, total $5,158; Alaska Propane, $3.11 per acre, $1,990.

. . . **Block 3,** southwest section: Bintliff, $10.68 per acre, $6,675; Alaska Propane, $7.35 per acre, $4,593.

. . . **Block 3,** southeast section: Bintliff, $11.51 per acre, $7,366; Alaska Propane, $3.11 per acre, $1,990.

. . . **Block 3,** northeast section: Bintliff, $11.51 per acre, $7,366; MacGoodstein, $7.11 per acre, $4,479; Alaska Propane, $3.11 per acre, $1,990.

. . . **Block 4,** northwest section: Bintliff, $10.59 per acre, $6,671; Alaska Propane, $3.11 per acre, $1,959.

. . . **Block 4,** southwest section:

Texans Rush to Be on Ground Floor for Vast

TO THE average Texan, second biggest isn't quite big enough.

Perhaps that's one reason why so many Texans are flocking these days to Alaska, which soon will commandeer some of the Lone Star state's fondest superlatives.

But the current exodus from Texas is not prompted by Alaska's superior size alone. The motivating force is oil—same thing which originally sent many settlers to what soon will be the second largest state.

Some of the blue bloods of the Texas oil industry are among the leaders in the northward migration. They include:

. . . **Continental Oil Co.,** which has just announced plans to join in the exploration of some 1,100,000 acres in Alaska.

. . . **Humble Oil & Refining Co.,** an "early settler," which has been drilling almost a year at its first wildcat in Alaska. Drilling was proceeding below 11,300 ft. last week at the isolated location in the Kanatak area.

. . . **Michel T. Halbouty,** Houston independent, who has announced formation of a new company to manage his Alaskan holdings.

. . . **Ralph Johnston and W. Stewart Boyle,** top executive of Texas National Petroleum Co., who have about 150,000 acres of oil leases in Alaska. A tour of their holdings is planned later this month by Johnston and several other associates interested in Alaska's oil potential.

. . . **John W. Mecom,** Houston independent, who was preparing to leave last week to study the possibilities of starting operations in Alaska.

Conoco deal . . . Continental announced that it was joining Colorado Oil & Gas Co., Denver, and Frankfort Oil Co., Dallas, to explore in the Yakutat area along the southeastern coast of Alaska.

J. S. Royds, Continental vice president in charge of exploration, said the other two companies have drilled two wildcats with encouraging oil and gas indications on their Alaskan acreage. A third test, now under way, is projected to 11,005 ft.

The Colorado-Frankfort acreage is said to be the largest single land holding in Alaska. It is 140 miles long and is 250 miles northwest of Juneau.

Under its agreement with Colorado and Frankfort, Continental may earn one-third interest in the Alaskan properties by performing certain exploration work through 1959 and into 1960. The agreement is subject to approval of the Secretary of Interior. Projected operations include both geophysical surveys and more exploration drilling. Continental can increase its ownership to 40% upon comple-

Bids by Six Companies

Alaska Propane, $3.11 per acre, $1,974.

. . . **Block 5,** northeast section: Alaska Propane, $3.11 per acre, $1,990; Watson, $1.11 per acre, $710.

. . . **Block 5,** northwest section: Bintliff, $8.06 per acre, $5,158; Alaska Propane, $3.11 per acre, $1,990.

. . . **In Range 3E:** Block 1, northeast section: Alaska Propane, $3.11 per acre, $1,990; Watson, $1.11 per acre, $710.

. . . **Block 1,** northwest section: Alaska Propane, $3.11 per acre, $1,990.

. . . **Block 1,** southwest section: Alaska Propane, $15.27 per acre, $9,772; Halbouty, $10.10 per acre, $6,464.

. . . **Block 1,** southeast section: Alaska Propane, $15.27 per acre, $9,772; Bintliff, $10.42 per acre, $6,668; Basic Materials, $1.07 per acre, $684.

. . . **Block 2,** northeast section: Halbouty, $10.10 per acre, $6,464; Alaska Propane, $7.35 per acre, $4,704.

. . . **Block 2,** northwest section: Alaska Propane, $7.35 per acre, $4,704.

. . . **Block 2,** southwest section: Alaska Propane, $15.27 per acre, $9,772.

. . . **Block 2,** southeast section: MacGoodstein, $10.13 per acre, $6,483; Alaska Propane, $7.35 per acre, $4,704.

. . . **Block 4,** northeast section: Alaska Propane, $3.11 per acre, $1,990.

. . . **Block 4,** southeast section: Alaska Propane, $7.35 per acre, $4,704; Basic Materials, $1.07 per acre, $684.

. . . **Block 5,** northeast section: Alaska Propane, $15.27 per acre, $9,772.

. . . **Block 5,** northwest section: Alaska Propane, $7.35 per acre, $4,704.

. . . **Block 5,** southwest section: Alaska Propane, $7.35 per acre, $4,704.

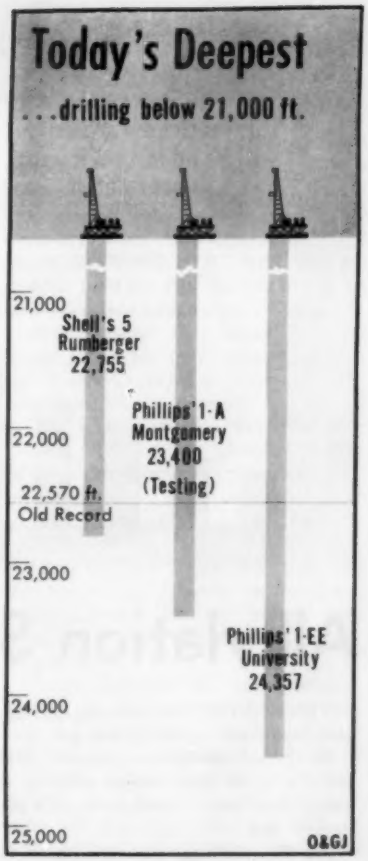
. . . **Block 5,** southeast section: Alaska Propane, $7.35 per acre, $4,707.

. . . **Block 6,** northeast section: Alaska Propane, $15.27 per acre, $9,772; Halbouty, $10.10 per acre, $6,464.

. . . **Block 6,** northwest section: Alaska Propane, $15.27 per acre, $9,772; MacGoodstein, $7.51 per acre, $4,581.

. . . **Block 6,** southwest section: Alaska Propane, $3.11 per acre, $1,990.

. . . **Block 6,** southeast section: Alaska Propane, $3.11 per acre, $1,990.



1-EE Drills Again

toward 25,000-ft. goal in Pecos County. Pipe arrives.

PHILLIPS Petroleum Co. resumed drilling at the world's deepest well last week after a month's layoff while awaiting new drill pipe.

The 1-EE University in Pecos County, Texas, stopped at 24,357 ft. until new high-tensile strength drill pipe could be delivered. The 3½-in. pipe was ordered for the top 10,500 ft. of the string. It is 15.50-lb., 43-40 grade steel.

The well was expected to hit the Ellenburger objective shortly after starting up again. Projected depth is 25,000 ft.

The world's second deepest well, Phillips' 1-A Montgomery in Pecos County, was still testing last week at 22,650-22,880 ft. Phillips has plugged back from 23,400 ft. total depth to make the series of tests.

Shell Oil Co.'s 5 Rumberger, the third deepest well, drilled below 22,755 ft. The well, which is in the Elk City field of western Oklahoma, is projected to 24,000 ft.

Oil Search in Alaska

tion of additional exploratory work beyond its initial commitments.

Colorado Oil & Gas, which has a base at Yakutat, will continue to supervise operations. Since 1956 Colorado and Frankfort have made extensive seismograph, gravitymeter, and surface geological surveys.

Halbouty's firm . . . The new company established by Halbouty is called Halbouty Alaska Oil Co. The company will begin operations this spring in either the Kenai or Porcupine basin.

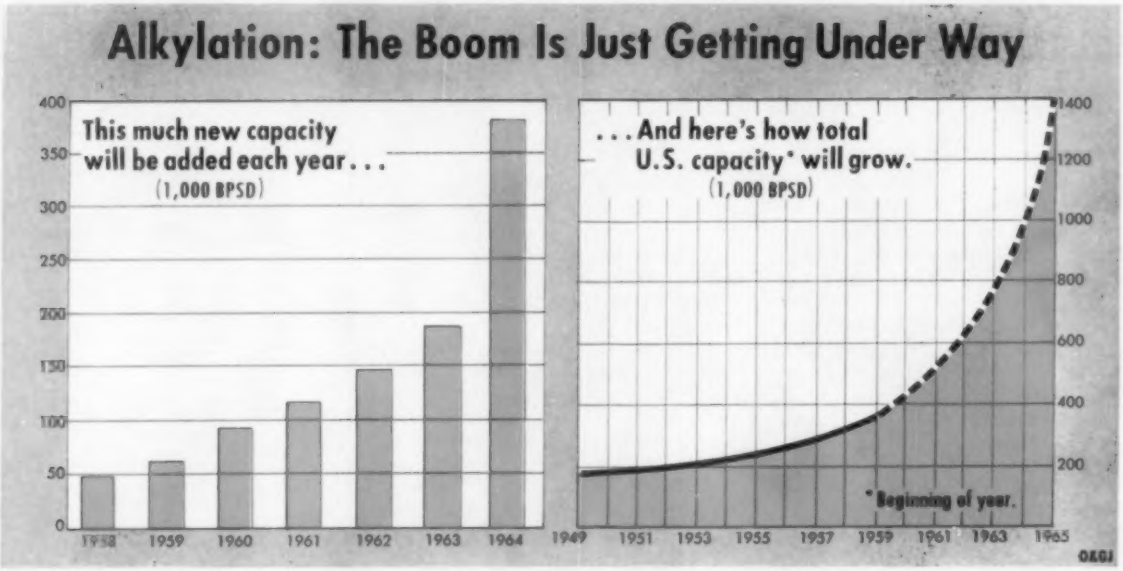
Halbouty's new firm, to be known as Halasko, will manage approximately 1,250,000 acres of mineral leases in Alaska. It was capitalized at $1 million and chartered in Delaware to explore for, produce, refine, and transport oil and gas and to engage in related activities.

Company headquarters will be in Houston. Halbouty indicated offices will be opened immediately in Anchorage and Denver.

Halbouty is president and chairman of the board. Two Denver men who have had experience in Alaska have been named vice presidents and directors. They are Raymond M. Thompson, formerly of the United States Geological Survey, who will be head of exploration, and Don R. Link, head of the land division.

Other Halasko directors include George C. Hardin, Jr., executive vice president; James Noel, general counsel and secretary; Frank K. Bruce, Jr., treasurer and comptroller; and Fay Renfro Halbouty.

James L. Ward is vice president, drilling and production. Other principals are R. E. Anderson, assistant secretary; Louis J. Darilek, assistant treasurer and chief accountant; T. E. Dobson, chief petroleum engineer; and J. E. Etheridge, land manager.



Alkylation Spree to Hit Peak in '64

ALKYLATION is entering its biggest expansion period in history.

In 1964 alkylation capacity will reach a level three times what it is today, well over 1 million barrels per stream day.

M. W. Kellogg Co. has made a study of alkylation growth for the next 6 years and predicts that each year's expansion will be greater than that of the previous year.

The climax will come in 1964. The capacity added during that single year will be greater than the total capacity in existence today.

The trend . . . The spurt in alkylate expansion the past 2 years clearly shows the trend.

A new peacetime record for new capacity was set in 1957, and this will be broken this year when 48,980 bbl. of capacity is added. Going into 1959 total capacity for the nation will hit 360,000. Not only that, but another 9,000 bbl. is now under construction for completion early in 1959.

Only in the frantic days of World War II was any more alkylation capacity placed on stream in any 1 year. And yet, at the end of World War II, the total facilities available could produce only about 178,000 bbl. per day—less than half the present capacity.

Avgas was the dominant factor that spurred alkylate demand in World War II and the Korean war.

Today motor fuel is responsible for the big push.

Avgas continues to play an important role in alkylate consumption, even with the advent of the jet age, but a plateau that will continue for some time to come has been reached.

The big impetus these days comes from the heavy demand for alkylate in motor fuel. Each year more and more refiners are blending the clean-burning alkylate into their premium grades. Some companies use as much as 35% in their premium blends.

As this trend continues, more and more refiners are being pushed to include alkylate in their motor fuels.

Heavy competition for the motor fuel market is responsible for the new emphasis on alkylation (see table).

Of 18 units going into operation this year, 12 are located in independent refineries. The independents have discovered that if they wish to sell to majors, or in competition with the majors, they have to make a high-quality motor fuel. And today—and even more so tomorrow—high-quality motor fuels must have alkylate.

One development noted this year is the sharp increase in hydrofluoric-acid units going on stream. Of the 48,980 bbl. of new capacity this year, 22,480 bbl., or 46%, will be the HF type, while sulfuric-acid units will account for the rest. Heretofore, HF has held about 20 to 21% of the total capacity.

Historic pattern . . . The presence of alkylate in motor fuel is not new.

Immediately following World War II, refiners with wartime alkylation units on their hands started dumping alkylate into motor fuel as a quick means of raising octanes. However, this was a stopgap measure, and many plants soon were shut down.

When the Korean war began, the Government forbade the use of alkylate in motor fuels and urged refiners to expand alkylation capacity for avgas. They did. And the amount of alkylate used in avgas doubled between 1950 and 1955.

By 1956, however, the use of alkylate in motor fuels was returning heavily. During that year alkylate used in motor fuels hit 55,000 bbl. per calendar day. For avgas, however, it was a hefty 186,000 bbl.

Demand for avgas alkylate is figured to stabilize at the 186,000-bbl. figure and taper off slightly by 1964. But for motor fuels, the Kellogg prophets foresee a demand of 208,000 bbl. in 1960 and an astronomical 892,000 bbl. in 1964.

Kellogg's study, conducted by Henry G. McGrath, George T. Cooper, and others, cites three factors which affect this sharply increasing trend:

. . . Octanes are expected to continue rising. Premium gasoline should hit better than 105 by 1964.

. . . Domestic demand for gasoline is is expected to grow to 4.74 million barrels daily by 1964, an increase of 23% over demand in 1958.

. . . Premium gasoline's cut of the market is expected to rise from a percentage in the low 30's to 40% by 1960.

These factors are bound to call for

Alkylation Units Going On Stream in 1958

Company—Plant location:	Type	Capacity BPSD
American Petrofina Co., Mount Pleasant, Tex.	Hydrofluoric	1,500
Anderson-Prichard Oil Corp., Arkansas City, Kans.	Hydrofluoric	2,200
Atlantic Refining Co., Port Arthur, Tex.	Sulfuric	2,100
Champlin Oil & Refining Co., Enid, Okla.	Hydrofluoric	1,500
Cooperative Refinery Association, Coffeyville, Kans.	Hydrofluoric	1,200
Clark Oil & Refining Corp., Blue Island, Ill.	Hydrofluoric	1,500
Delta Refining Co., Memphis	Hydrofluoric	1,200
D-X Sunray Oil Co., Tulsa	Hydrofluoric	3,000
El Paso Natural Gas Products Co., Odessa, Tex.	Hydrofluoric	1,250
Esso Standard Oil Co., Baton Rouge	Sulfuric	10,000
Leonard Refineries, Inc., Alma, Mich.	Hydrofluoric	1,000
Magnolia Petroleum Co., Beaumont, Tex.	Sulfuric	8,000
Ohio Oil Co., Robinson, Ill.	Sulfuric	500
Shell Oil Co., Anacortes, Wash.	Sulfuric	2,400
Skelly Oil Co., El Dorado, Kans.	Hydrofluoric	3,500
Standard Oil Co. (Ind.), Mandan, N. D.	Hydrofluoric	1,630
Standard Oil Co. (Ohio), Cleveland	Sulfuric	3,500
Wilshire Oil Co. (Pontiac Western Corp.) Norwalk, Calif.	Hydrofluoric	3,000
	Total	**48,980**

more high-octane, high-quality alkylate.

Why alkylate? . . . Alkylation units produce a mixture of isoparaffins. The prime component is 2,2,4 trimethylpentane (iso-octane).

Alkylate is produced by reacting butylenes, plus some propylenes and amylenes with isobutane in the presence of an acid catalyst. The final product is a clean-burning fuel particularly high in octane number and suitable for blending to the high-grade 115/145 performance number aviation gasolines.

Possibly more important than its octane number is the sensitivity rating of alkylate. Sensitivity is defined as the difference between the research octane number and the motor octane number (OGJ, Aug. 4, p. 49).

Alkylate actually has a minus sensitivity. This means it can be downgraded with poor components before the blend would have even a sensitivity of 1, and it can take a considerable amount of low-gravity material before reaching a sensitivity of 10, above which fuels show up poorly under driving conditions.

Another advantage of alkylate is that it produces no rumble. Rumble is caused by abnormal combustion in engine cylinders and results in a sharp rise in pressure accompanied by vibration.

Finally, alkylate stands out on its octane number alone. Its research octane number runs around 103 and its road octane (Uniontown) tops 107, higher than any other common motor-fuel component.

Raw materials . . . There is a considerable danger that refiners will face a shortage of both olefins and isobutane, two chief components of alkylate, unless new units are built to meet the heavy demand between now and 1964.

Generally, the olefin charge stock to alkylation units consists primarily of butylenes. But operators in the past have sometimes varied their charges by adding propylenes and amylenes to increase their alkylate.

Lately these other olefins have showed up consistently in alkylate feed stocks as capacity increases. Magnolia Petroleum Co.'s Beaumont refinery has a new 8,000-bbl. unit that alkylates an olefin feed of 85% propylene and 15% butylene.

So far, virtually all olefins used in alkylate manufacture have been obtained from refinery gases. But there is one notable exception at Texas Butadiene & Chemical Corp.'s plant near Houston, where butanes are dehydrogenated catalytically to butadiene and butylenes.

Isobutane, the second required charge stock for alkylate, is obtained generally from natural sources. The primary supply comes from gasoline plant butane streams from which the isomer is fractionated.

Again, there are exceptions to this rule which show the trend of the times. Three butane isomerization units are under construction in the U. S.

The outlook is clear: More olefin and isobutane units must be built to prevent a shortage of alkylate components in the years of rapid alkylation expansion ahead.

Skelly to Switch

from gas to butane in oil-recovery project in Texas.

SKELLY OIL CO. disclosed last week that it plans to kick off soon a $400,000 experimental butane-injection project in an effort to hike oil recovery from the Brown dolomite under its Watkins "A" lease in Panhandle field of Hutchinson and Carson counties, Texas.

Skelly asked the Texas Railroad Commission for permission to stop a gas-injection operation and start butane injection in its place.

The lease currently has nine producing wells making about 120 bbl. of oil daily—about 13 bbl. daily each on the average. The company plans to drill three more wells on the 150 acres.

Plans are to stop gas injection into the Nos. 1 and 9 wells on the lease, inject 150,000 bbl. of butane into them, and follow this with 500 M.c.f. of gas daily.

Added recovery was not estimated. But J. H. Dunlap, Skelly engineer, told the commission Skelly thinks it will recover a substantial volume of oil which otherwise couldn't be produced. The nearest successful program of the type, Dunlap said, is being carried out by Cities Service Oil Co. on its Weir "A" lease in the West Pampa area.

The Watkins "A" lease is part of the Watkins cooperative gas-injection program. Skelly said it had approval of the Watkins operators' committee to conduct the project.

Interior Pushes Helium Plans

THE INTERIOR Department is moving fast to avert a helium shortage.

Building of a fifth extraction plant, in the Keyes gas field in Cimarron County, Oklahoma, will start in a few months. The department signed a contract last April with the Colorado Interstate Gas Co. for exclusive rights to the helium in gas produced by the company. President Eisenhower signed a bill late last month carrying $12 million for the new plant.

The Keyes plant is designed to process up to 70 million cubic feet of gas daily. The 2% helium content of the Keyes field gas will give the department 200 to 290 million cubic feet of helium annually.

The Colorado Interstate contract is the first step in a $250-million expansion program by which the department hopes to recover some 3 billion cubic feet of helium a year.

Quick Look at the Latest Import Figures:

CRUDE OIL—DIST. 5
(Thousands of barrels daily)

Importers:	Allocation July 1958	Actual July 1958
Bankline Oil	2.3	...
Caminol Co.	2.9	3.0
Douglas Oil	4.6	...
Edgington Refineries	2.9	2.4
Fletcher Oil	5.3	...
General Petroleum	24.8	20.8
Golden Eagle Refining*	...	...
Hancock Oil	4.0	...
Macmillan	2.4	2.4
Mohawk Petroleum	3.0	...
Richfield	8.9	8.4
Rothschild	2.7	...
Shell Oil	31.6	21.5
Standard of California	28.9	26.1
Sunland Refining	2.4	...
The Texas Co.	20.0	19.6
Tidewater	36.9	50.4
Union	12.1	10.3
U. S. Oil & Refining	7.8	...
Wilshire	17.6	11.5
Total	**221.1**	**176.4**

*Allocation 2,300 B/D effective 7-10-58.

CRUDE OIL—DIST. 1-4
(Thousands of barrels daily)

Importers:	Allocation July 1958	Actual July 1958
Atlantic Refining	51.7	54.0
Bay Refining	2.8	2.8
Cities Service	28.7	27.8
Clark Oil & Refining	2.0	...
Crown Central	4.4	4.4
Danaho Refining*	...	†0.5
Delta Refining	...	‡9.0
Dow Chemical Co.	0.3	...
Eastern States	16.1	n.r.
Gabriel Oil	6.6	6.3
Great Northern	29.0	27.0
Gulf Oil Corp.	98.0	96.6
Hess, Inc.	10.1	...
Ingram Oil & Refining§	3.5	†3.4
International Refineries	10.8	10.8
Lakehead Pipeline	0.3	0.2
Murphy Corp.	4.4	6.1
Northwestern Refining	11.9	9.6
Phillips Petroleum	10.6	8.7
Pure Oil Co.	5.0	4.8
Republic Oil Refining	4.0	...
Shell Oil Co.	6.6	3.1
Sinclair Refining	54.6	54.8
Socony Mobil	59.0	59.0
Southwestern Oil	2.6	...
Standard of California	58.7	50.0
Indiana Standard	26.2	22.2
Jersey Standard	63.2	63.2
Standard of Ohio	7.2	11.0
Sun Oil Co.	44.3	37.1
Tennessee Gas-Bay Petroleum	3.5	5.9
Texas Asphalt	2.0	...
Texas City Refining	4.0	4.1
The Texas Co.	47.9	47.5
Tidewater	30.0	17.5
United Refining	3.0	5.6
Total	**713.0**	**653.0**

*Allocation 500 B/D effective 7-24-58. †Partial month. ‡Estimated. §Allocation 3,500 B/D effective 7-15-58.

UNFINISHED GASOLINE, OTHER OILS
(Thousands of barrels daily)

Importers:	Average May-June 1958	Actual July 1958
Atlantic Refining	5.7	15.6
Crown Central	5.6	...
Gulf Oil Corp.	16.3	15.9
Hess, Inc	25.3	...
Sinclair Refining	7.3	6.3
Socony Mobil	19.7	21.9
Southwestern Oil	4.1	12.3
Standard of California	8.5	11.5
Standard of Indiana	24.8	24.5
Standard of Ohio	1.7	...
Texas City Refining	7.0	10.6
The Texas Co.	13.8	10.9
Tidewater	20.0	4.3
Union	4.7	4.5
U. S. Oil & Refining	2.6	...
Total	**167.1**	**138.3**

July Crude Imports Show Sharp Drop

CRUDE IMPORTS fell off sharply in July, dropping to 829,400 bbl. daily from 932,200 bbl. a day in June.

Imports into Districts 1-4 declined to 653,000 bbl. daily from 736,100 bbl. the previous month. They were 60,000 bbl. under the 713,000-bbl. over-all quota and 225,000, or 27.5%, under July 1957.

District 5 imports dropped to 176,400 bbl. daily from 196,100 bbl. in June. They were 44,700 bbl. under the area's quota of 221,100 bbl. and 163,600 bbl., or 48%, under July of last year.

Figures released last week by Capt. M. V. Carson, Jr., imports administrator, showed for the first time imports of unfinished gasoline and other unfinished oils (see table). The data was furnished by importers in compliance with a request in July that unfinished imports be held at their May-June level.

Total imports of unfinished products in July were 138,300 bbl. daily, against a May-June average of 167,-

100 bbl. This is 28,800 bbl. daily below the May-June average.

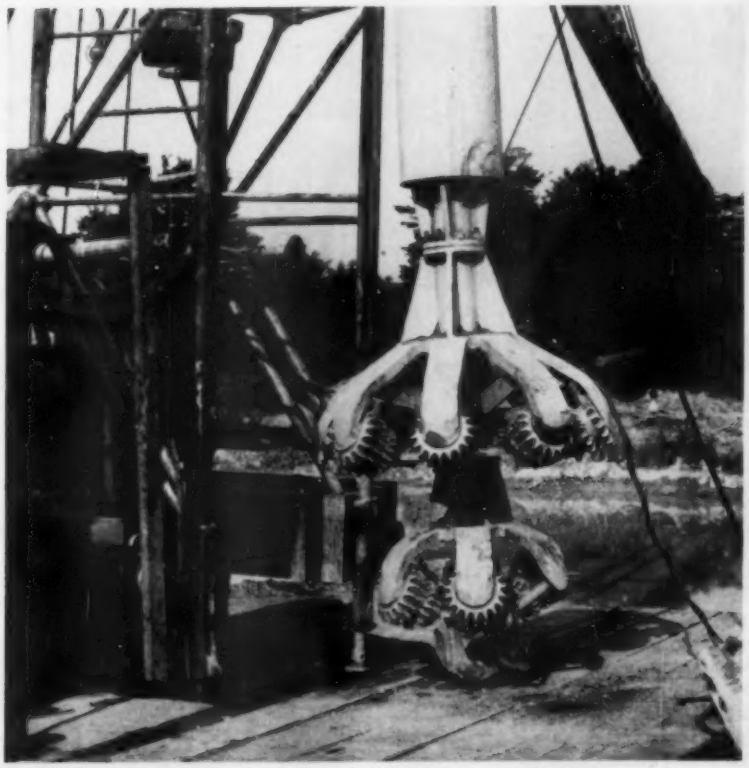
Only seven of the 36 companies covered by the figures for Districts 1-4 failed to live within their quotas in July. One of these, Delta Refining Co., had no allocation for July but brought in about 9,000 bbl. a day.

The only "established" importer to exceed its quota was Atlantic Refining Co., with entries of 54,000 bbl. daily against 51,700 bbl. allowed.

An eighth company, Eastern States Petroleum & Chemical Corp., failed to submit a report of its imports. The company has a quota of 16,100 bbl. daily.

In District 5 only two of 20 quota-holders exceeded their allowables. Caminol Co. ran 100 bbl. daily over its 2,900-bbl. quota. But Tidewater Oil Co., with a quota of 36,900 bbl., brought in 50,400 bbl. daily.

The figures on unfinished products showed 15 importers. Five of them exceed their May-June averages.



Big Bit Drills Mine Shaft

IT TOOK four stages to drill a mine shaft 53 in. in diameter for an LPG underground storage project near Middletown, Ohio.

Shallow-hole rotary rigs were used to drill the mine shaft, several air shafts, and an escape shaft for the cavern being mined for Texas Eastern Transmission Corp. All holes are drilled to 355 ft.

An 8⅝-in. pilot hole for the mine shaft was drilled with a Failing 1500 rig and rock bits. Then a Jed-A rig was moved in and the hole reamed to 20 in. The next stage was completed with a 36-in., 6-cutter bit, and the hole finally was enlarged to 53 in., with an 8-cutter bit. It is cased with 42-in. pipe.

Twenty feet of 53-in. hole was made each 24 hours. Bit repairs usually were required after each trip. On the average, the bit was rotating on bottom 14 out of every 24 hours.

The air shafts are 17 in. in diameter and cased with 12-in. pipe. The escape shaft is 26 in. and cased with 20-in. pipe.

Texas Eastern's finished cavern will have a 12,000,000 gal. capacity. Miners go down the shaft to excavate at the bottom of the hole.

Two reasons why Texas Eastern decided on the underground system: Savings and safety. Underground-storage costs run about $5 to $7 per barrel, compared with about $25 per barrel for tank storage aboveground.

Industry briefs

Seaboard Oil Co., Monterey Oil Co., and Humble Oil & Refining Co. have quitclaimed two offshore leases at Huntington Beach. An extensive coring program failed to turn up anything encouraging on the leases. The three companies paid $4,700,000 in cash bonuses for the leases several years ago. The two tracts are split into a 1,280-acre lease and 1,355-acre lease.

American Trading & Production Corp. has launched a new flagship, the SS Maryland Trader, a jumboized T-2 tanker of 20,000 dw. tons. The 572-ft. ship is 48 ft. 6 in. longer than the original vessel and has a capacity of 175,000 bbl., 25% more than the original capacity. The conversion was done at the shipyard of Maryland Shipbuilding & Drydock Co. The tanker was out of service only 65 days.

Sunset International Petroleum Corp. has acquired an additional 22% interest in the Southwest Mount Vernon Oklahoma field for $340,000. It increased the company's holdings in the field to 27 net wells on 1,500 net acres producing 255 net barrels of oil a day and 5,500,000 cu. ft. of gas daily.

Eastman Kodak Co. is now making a polypropylene on a pilot plant scale at the Texas Eastman refinery at Longview, Tex. Eastman said the process being used was invented by company scientists at the Tennessee Eastman research laboratories at Kingsport, Tenn. When developed for commercial use, the polypropylene will be marketed by Eastman Chemical Products, Inc.

Continental Oil Co. will complete a new wholesale bulk plant at its Denver refinery about November 1. The plant will include 19 storage tanks with combined capacity of nearly 500,000 gal. Also included will be a large warehouse, office building, and loading facilities. The plant will provide the largest liquid wax storage in the Rocky Mountain area, with four tanks having a combined capacity of 40,000 gal.

Franklin Supply Co. has moved its headquarters from Chicago to Denver. Franklin has 23 oil-well supply stores in the U. S. and Canada. The Denver headquarters' address is 2175 South Cherry Street.

Clay pots, trust busting, and subsoil rights

CLAY pots unearthed in Peru were used for burro-back transportation of crude oil and refined products around 1850—a decade before the oil industry started in North America.

Records show that the Spaniards began commercial development of oil seeps long known near Talara, site of Peru's present refining and shipping center. They boiled down the crude oil in iron kettles to get a residuum pitch which they hauled in these jugs to the beach and used it to calk ships.

Technological progress in the oil industry was slow in those days, for the iron kettles were only a slight improvement over clay caldrons used for the same purpose at the same place at least 200 years earlier.

An oil concession covering 639 sq. miles, the La Brea y Parinas Estate, was granted by the King of Spain about 1600. An ancient book on Peru tells of a visit to La Brea in 1640 and describes the operation of the oil-reduction plant then in operation.

In 1889 British capital formed London & Pacific Co. which acquired the concession from the heirs of the estate and began commercial production of oil. Early in the twentieth century Peru granted oil concessions to a number of British and American operators, including Herbert Hoover.

But it was the Supreme Court of the United States that was most responsible for Peru's oil development. In 1911 the court dissolved the old Standard Oil Co. and broke it up into 34 competing groups. This left Standard Oil Co. (N. J.) with large markets in the Far East but divorced from its Pacific Coast source of supply which had been turned over to Standard Oil Co. of California.

So in 1913 Jersey formed International Petroleum Co. which purchased the La Brea and other concessions, including Hoover's. Within a couple of years International increased Peru's production from 400 to 5,000 bbl. per day and completed a refinery and tanker terminal at Talara from which it supplied most of Jersey's markets in the Orient.

The Peruvian Government challenged International's claims, but in 1922 the International Court of Justice at The Hague validated the concession as originally granted by the King of Spain. All the rest of the subsoil in Peru belongs to the nation, but International has fee ownership of the oil under the 639 sq. miles where it uncovered these first "oil drums."

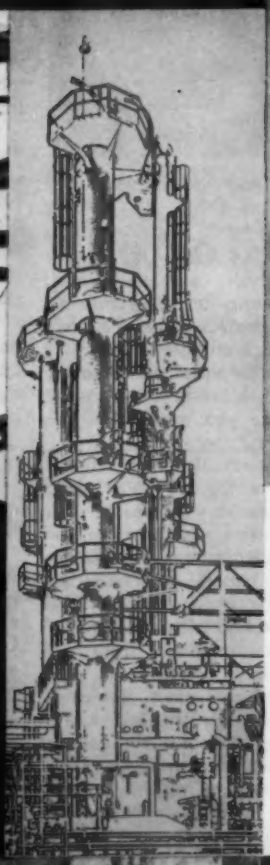
CHAPTER 1

PROFILE— of an Industry

It was such combinations of apparently unrelated events as described at the left that shaped the growth of the oil industry all over the world.

Unraveling such threads of history has been a project of Journal editors for several months in preparation for publication of "Petroleum Panorama," an extra issue of this magazine to be distributed early in 1959, the centennial year of the oil industry in the United States.

The historical part, of which this Peruvian story is an example, will be largely in the first chapter, "Profile of an Industry." It will give the highlights—briefly and without irrelevant details—of the interaction of events and forces that caused the world's oil industry to develop where and how it is today.



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. . . the most important investment you can make is in the creative ability of men.

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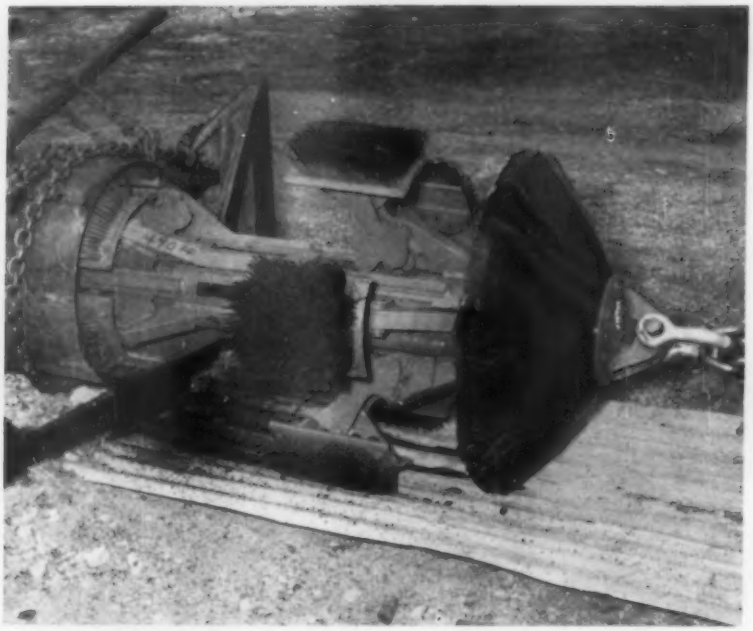

CONE-TYPE rubber cups and parallel brushes are part of design in . . .

New Pipeline Scraper Tested

A NEW BREED of "pig" has been developed to solve a modern pipeline-scraping problem.

Service Pipe Line Co. has designed and tested a new pig, or scraper, for cleaning pipelines having as many as four different pipe sizes. It will fill a need arising from the practice in recent years of connecting loops of several different diameters into a continuous line.

Variable-diameter pigs have been available up to now for a range of only two pipe sizes.

Basic design of the new scraper was conceived by A. M. (Art) Hill, superintendent of line maintenance for Service. Also involved in the development were Jim Fugate, engineer, and John Tomer and Tony Mass, senior draftsmen.

It was built for a range of 18 to 24-in. pipe specifically for a section of line between Manhattan, Ill., station and the Whiting, Ind., terminal. There a 24-in. loop was connected to the existing 18-in. line last year. Designers were aided in their work by experience 3 years ago in developing a 12 to 16-in. scraper.

Scraper design . . . This new breed of pig has two design innovations:

. . . Cone-type rubber propelling cups fastened at either end with "V" notches to permit expansion and contraction to fit changing diameters. The scraper also cleans itself. Part of the oil stream pushing the scraper flows through these grooves and washes out sludge which has collected ahead.

. . . Brushes mounted on parallel arms. Each brush exerts an even pressure against the pipe wall when the scraper enters a larger diameter.

The first test revealed the need for modifications, which are under way. There was excessive wear on the rubber cups. Heavier main springs for brushes, providing improved centering action, should remedy this. Another change may be construction of the body of aluminum alloy instead of steel to reduce the weight from 490 to about 200 lb.

The changes are minor, however, and Service is sufficiently pleased with the basic design to apply for patents on it. The next step in the scraper-development program will be to build three models in smaller sizes down to 8 in.

The test scraper was designed by Service Pipe Line personnel and built in the company's Tulsa shops for the most part. The propelling cups were made by a manufacturer to Service's design.

The company's first contribution to developing modern pipeline scrapers was made 25 years ago. Service substituted rubber disks for the leather propelling disks used on the old go-devil type of scraper. The rubber disks were more durable and free from much of the trouble resulting when scrapers were stuck in the line.

Arizona Test Hits

for Humble to become state's second and best oil well.

ARIZONA'S second—and best—oil well was completed last week by Humble Oil & Refining Co. It flowed at a rate of 1,044 bbl. daily.

The well is the 1 Navajo E, in the Boundary Butte area of Apache County about 2 miles south of the Utah line. Production was from the Hermosa limestone (Pennsylvanian) through perforations at 4,600-75 ft.

The well is 1¼ miles south of the Boundary Butte discovery well, a gas well completed in Pennsylvanian rocks by Shell Oil Co. in 1954. The only other oil well in Arizona is Humble's 1 Tribal, completed in the Paradox (Pennsylvanian) in 1955 for 47 bbl. of oil plus 4 million cubic feet of gas per day. The state has three gas wells.

Humble said the new strike is on the south flank of the Boundary Butte structure. Tests indicated other possible pay zones. A substantial flow of gas was recorded in the Paradox at 4,865-93 ft., Humble said.

Production is 42.5°-gravity oil. Humble did not classify the well as a wildcat, because of its nearness to other producers. It represents, however, the first really sizable oil potential yet recorded in the State of Arizona.

PIPELINE

B. C. Hall Constructors, Inc., Aztec, N. M., is laying an undetermined number of miles of 4 through 20-in. gathering lines for El Paso Natural Gas Co. in the San Juan basin. The project will require the rest of 1958 to complete.

The Pipeline Transportation Section of the World Power Conference will meet September 7-11 in Montreal under the chairmanship of Eldon V. Hunt, general superintendent, Alberta Gas Trunk Line Co., Ltd. Papers will be presented on economic trends in pipelining fuel, a new type noncorrosive high-pressure pipe, the economic transportation range of artificial gas, and underground storage of natural gas. Speakers will be from Canada, Indonesia, Poland, and France.

Buckeye Pipe Line Co. should complete pipe laying this week on a 51-mile, 10-in. products line from Syracuse to Utica, N. Y. The $2,800,000 project, contracted to Sheehan Pipe Line Construction Co., Tulsa, will ex-

Kendavis Firm Is Established

A NEW management organization, known as Kendavis Industries, Inc., International, has been formed to oversee operations of 19 affiliated companies.

Headquarters for the corporation is in Fort Worth. President Ken W. Davis said it was set up to permit more efficient and economical management of the 19 companies.

The affiliated companies include: Mid-Continent Supply Co.; Loffland Brothers Co. and its five affiliates; Unit Rig & Equipment Co.; Great Western Drilling Co.; and Stratoflex, Inc.

Also, Cia. Pionera de Venezuela, C.A.; CP-Harrisburg, Inc.; Cummins Sales & Service, Inc.; Cummins Sales & Service de Venezuela; C.A.; Dorris Ballew, Inc.; Mid-Continent Cummins Export Corp.; Mid-Continent Supply Co. of Venezuela, C.A.; Pioneer Well Services, Ltd.; and Stratoflex of Canada, Inc.

At the same time, Davis stepped up from president to chairman of the board of five of the companies, CP-Harrisburg, Cummins Sales & Service, Midcumport, Stratoflex, and Stratoflex of Canada.

Other officers of the new organization include: Vice president and comptroller Ken Davis, Jr., who also

KEN W. DAVIS

is chairman of the board of Loffland Brothers Co. and of Unit Rig; general vice president Thomas N. Shults, who is president of Midcumport and a Mid-Continent vice president; vice president, manufacturing, John W. Tullis, Stratoflex vice president and general manager; and vice president, communications, Victor LeMay, Mid-Continent public relations and advertising director.

Others are: Vice president, drilling, R. J. Bromell, Great Western chief engineer; vice president, merchandising, P. Z. Hilliard, Mid-Continent general division manager; vice president, traffic, Dan D. Rogers, Mid-Continent traffic manager; vice president, treasurer and assistant secretary, Walter E. Strittmatter, Mid-Continent assistant treasurer; vice president, real estate, Jack P. Jones, Mid-Continent personnel and general office manager; vice president, legal counsel, Warren Scarborough, Mid-Continent director; and secretary and assistant treasurer, B. L. Coontz, Mid-Continent assistant secretary.

An advisory committee also was established for Kendavis. Members include:

D. H. Thornbury, Mid-Continent president; M. C. Cornish, Mid-Continent secretary-treasurer; R. C. Tucker, Great Western president; R. W. Wire, Loffland Brothers president; Dorris Ballew, president of Dorris Ballew; J. L. Vint, president of Unit Rig; J. T. Calnon, new Cummins Sales & Service president; C. A. Thomas, new Stratoflex president; L. J. Troutz, Cummins Sales & Service of Venezuela, vice president and general manager; W. F. Ogden, vice president and general manager of Loffland Brothers de Venezuela; and T. P. Tarwater, new president of CP-Harrisburg.

BRIEFS . . .

tend pipeline transportation of products to Utica for the first time.

A. C. Holder Construction Co., Inc., Tulsa, is winding up two projects involving takeup and reconditioning of old crude lines in Oklahoma. The jobs included 13 miles of 2, 3, 4, and 6-in. for Mid-Continent Pipe Line Co. near Fairfax and 31 miles of 6-in. for Bigheart Pipe Line Co. from Hominy to Skiatook.

Northern Natural Gas Co. is seeking a temporary permit to build 103 miles of 30-in. loop and install 14,000 hp. on its main line to increase capacity by 100,000 M.c.f. daily. The new capacity would permit Northern to serve northern Illinois markets for the first time. Northern is seeking temporary authority to go ahead in order to complete new facilities for operation during the coming heating season.

Saskatchewan Power Corp. this week will dedicate its 90-mile, 14-in. trunk line which will provide a market for 383 billion cubic feet of gas, perhaps more, in Hatton-Many Islands field on the Alberta-Saskatchewan border. The line extends from the field to SPC's Success-Moose Jaw system.

In Many Islands field, 210,870,000,000 cu. ft. is dedicated to the line. The producers, Crescent Petroleum Corp., Tulsa, and Britalta Petroleums, Ltd., Calgary have completed a 19-well drilling program and now have 22 wells hooked up. The companies consider their entire 152,000-acre holdings to be productive with 230 locations. The drilling program indicates reserves of 650 billion cubic feet compared with 440 billion estimated in 1956 by DeGolyer & MacNaughton, according to Britalta engineers.

Also for Pipeliners . . .

IN THE NEWS: First fluid-flow measuring device based on weight instead of volume of crude has been designed for use in LACT systems (p. 66) . . . Intrastate gas line is planned in Texas to gather gas from nine counties to supply Austin (p. 79) . . . Service Pipe Line has completed the pipe-laying part of its Rocky Mountain expansion project (p. 79) . . . Jayhawk Pipeline has started taking crude, providing an outlet for Oklahoma, Kansas fields (p. 82) . . . Vast array of pipeline equipment is leaving Houston for work on two major pipeline projects in Argentina (p. 83).

A complete list of pipeline projects is published the last issue of each month. New jobs and contracts are reported each week in Pipeline Briefs.

PLUS THESE TECHNICAL REPORTS: A new way to measure product in slack lines (p. 88) . . . Capacitance measurement is valuable for process-stream analysis (p. 96) . . . Automation pays off at pipeline terminal (p. 113).

Congrats and $25 to Doug Foster, Atlantic Refining Co., Dallas, Texas

Drilling for and producing oil and gas is a rugged business demanding great risk and courage. More, it requires plenty of rugged, dependable pipe. That's why Lone Star Steel was established in the heart of oil country.

The huge Lone Star plant, a modern miracle of automation and quality control, makes the kind of tough casing, tubing and line pipe American Petroleum Institute specifications call for. And, as Joe Roughneck knows, Lone Star offers a real convenience in fast, economical delivery.

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Intrastate Gas Line

planned in Texas. Line will move gas from nine counties to supply Austin.

CONSTRUCTION may start late this month on a new 370-mile pipeline system to gather gas in nine West Central Texas counties and move it to Austin.

The new gas system, including 120 miles of 14 and 12¾-in. main line and 250 miles of 2 to 10-in. gathering lines, would sell gas directly to the city of Austin for electric-power generation.

The line would be built and operated by a new company, Capital Gas Pipe Line Co. Gas reserves for the project have been rounded up by a related firm, Mid-Tex Gas Co., Dallas.

John G. Pundt, Dallas, president of Mid-Texas, told the Journal last week that the new system, to cost about $9,000,000, would take gas initially from 120 gas wells now shut in in Hamilton, Eastland, Erath, Stephens, Palo Pinto, Parker, Coleman, Brown, and Comanche counties. These wells, he said, have potentials ranging between 8,000,000 and 25,000,000 cu. ft. of gas daily. Part are owned by Mid-Tex, the remainder by independents committed under long-term contracts. The wells are mostly shallow-producing from the Marble Falls, Bend, and Strawn pays.

Surveying for the project is under way and should be completed in about 2 weeks, Pundt said. Pipe laying would begin immediately thereafter. Construction contract already has been let to N.A. Saigh Co., Inc., San Antonio. Pundt said Capital Gas Pipe Line expects to begin gas deliveries to Austin by the first of the year, as specified in a contract with the city, on the order of about 35,000,000 to 40,000,000 cu. ft. daily. Capacity of the system is about 135,000,000 cu. ft. daily.

The contract provides that the company is to supply the city with all the gas it should need in the future. Austin, Pundt said, expects eventually to need at least 200,000,000 cu. ft. daily from West Central Texas.

Who's behind it . . . Mid-Tex Gas would buy all gas and sell it to Capital Gas Pipe Line Co. for resale to the city of Austin.

Gas would be bought in the field at an initial price of 9 cents an M.c.f. The price would escalate upward at a rate of ½ cent per M.c.f. per year to a maximum of 15 cents. Since the entire operation is intrastate, neither starting or escalated prices will be subject to review by the Federal Power Commission.

Selling price at the Austin city gate has not yet been disclosed.

Officers of Mid-Tex and of Capital are the same. Pundt heads both as president. Vice presidents include: R. Jacques T. du pont, of Wilmington, Del.; B. J. (Buck) Wynne, Dallas businessman and brother of Toddie Lee Wynne, Dallas oil operator; James P. Roszel, Evansville, Ind., oil operator; and E. D. Thomas, Dallas. Curtis B. Dall is secretary-treasurer.

Pasotex Buys Crude Lines

PASOTEX Pipe Line Co., wholly owned by Standard Oil Co. of Texas, has bought two crude-oil gathering systems operated by Gulf Refining Co. in Scurry County, West Texas. The systems serve the SACROC unit in Kelly-Snyder field and the Sharon Ridge Canyon unit in Sharon Ridge Canyon field.

The two systems handle about 5,000 bbl. of oil daily. They will be tied into Pasotex's main line which now carries about 43,000 bbl. daily from the Kelly-Snyder area to Wink.

Purchase price for the lines was not disclosed.

The JOURNAL Said . . .

50 years ago

September 6, 1908

In an opinion in which all the justices concurred, the Supreme Court of Oklahoma on August 29 decided that Attorney General West had proceeded without authority when he filed suit against the Prairie Oil & Gas Co. The opinion upholds Governor Haskell in every particular and makes it possible for the Prairie company to resume the laying of additional pipe lines.

The decision removed the only obstacle to the construction of the contemplated lines in the Cherokee districts, and proposed trunk line to New Orleans by way of Arkansas and Louisiana.

Consul General Norman Hutchinson, of Bucharest, reports that several high officials of the Austrian railways have arrived in Romania for the purpose of studying the question of petroleum as a railway locomotive combustible.

It appears to the writer that petroleum seems to answer the purpose for the making of sufficient steam, and does away with coal dust and cinders; on the other hand, the odor of smoke issuing from the locomotive is offensive to many persons, while others consider it more or less healthy.

25 years ago

September 7, 1933

A further advance in crude-oil prices in the Mid-Continent area, probably approximating 25 cents a barrel, is expected to be announced this week. Such an increase would be a long step towards the basic price of $1.11 per barrel for 36 grav. Mid-Continent crude which it is expected the Government will establish in the very near future . . .

There is a greater confidence prevalent in the petroleum industry now than has been felt for a long time.

The new felony bill making violations of the Railroad Commission's proration orders a felony punishable by fine and imprisonment went into effect September 1, thereby tightening proration in East Texas.

10 years ago

September 9, 1948

Major refineries with an aggregate crude-processing capacity in excess of 700,000 bbl. daily were shut down by strikes this week. In California an estimated 16,000 members of the Oil Workers International Union (CIO) walked off their jobs.

The Bureau of Mines last week added up the supply and demand situation and joined in the spreading conclusion that the oil shortage is over.

Steel industry spokesmen are warning that steel will be even tighter after the turn of the year than it is now. At the moment, steel pipe is the tightest item, harder to get and in greater demand than steel sheets, and some mills now have booked oil-company orders for delivery as far hence as 1953.

Wyoming Line Laid

to complete first phase of Service expansion program.

THE PIPE-LAYING phase of Service Pipe Line Co.'s Rocky Mountain-Midwest expansion has been completed and new station machinery is being installed to increase delivery capacity 39,000 bbl. daily by December.

O. R. Burden Construction Corp., Tulsa contractor, has laid 123 miles of pipeline in Wyoming. The 30-mile, 12-in. line from Salt Creek station, giving North Fork field its first pipeline outlet, is in operation. A 17-mile, 12-in. loop north from the Casper station toward Salt Creek has been tied in.

A 76-mile, 20-in. construction program between Casper and Fort Laramie also has been completed. The 20-in. replaces 54 miles of 12-in. between Fort Laramie and Glendo Junction and between Welch station and South Cole Creek Junction.

Pumping machinery totaling 12,200 hp., both diesel and electric, will be installed at stations in Wyoming, Colorado, and Kansas. The Service line supplies refineries in the Kansas City, St. Louis, and Chicago areas.

Sohio Talks Slow Down

. . . at processing plants. Sohio offers to meet pay raises of other refineries in areas affected. Checkoff is canceled.

STANDARD OIL CO (Ohio) is operating three refineries and a petrochemical plant without union contracts.

Contracts with the Oil, Chemical and Atomic Workers International Union have expired at the Toledo and two Cleveland refineries and at the Lima petrochemical plant. OCAW agreements covering Lima refinery and pipeline workers are open on 60-day notice. The contract at Latonia, Ky., is closed for 1 year.

Sohio has offered to extend present contracts at Toledo and Cleveland for 2 years and, during the contract period, to meet any wage increases given by three of seven previously designated refinery companies in the Great Lakes area.

Since the expiration of the contracts Sohio has canceled checkoff of union dues and has not recognized maintenance-of-membership provisions or arbitration procedures for grievances.

Negotiation meetings have been scheduled at the Toledo and Lima operations.

The issues . . . Bargaining at the Cleveland refinery is bogged down in 41 issues—7 company and 34 union.

In the Toledo negotiations, the union has made an issue of the company's right to assign work arbitrarily, especially maintenance.

W. M. Murphy, OCAW local chairman at Toledo, has charged in a letter to Sohio President C. E. Spahr that the company is "pushing for a strike" and that plans have been drawn to operate the plant in event of a work stoppage.

A Sohio spokesman replied that the company is just starting up its new $40-million Toledo refinery "and we certainly don't intend to shut it down." As for drafting plans to operate the plant during a strike, Sohio always has in readiness a system for running the plant during any type of emergency.

Sohio said the Cleveland and Toledo contracts were terminated with written notice served on the company by the union. The Toledo contract was terminated August 16 and the Cleveland contract August 18.

Each plant manager has full authority to negotiate an agreement for his employes, but each manager, according to Sohio, has been advised by the local union committee that the committee cannot arrive at an agreement if the nation-wide mandatory demands of the OCAW are not met.

At the Lima petrochemical plant, the OCAW barely edged an independent union in a recent National Labor Relations Board election. The vote for OCAW representation carried 61 to 56 over the Sohio Chemical Workers Association.

Because of the election, negotiations for a new contract were delayed and are just now getting under way. No company offer has yet been made.

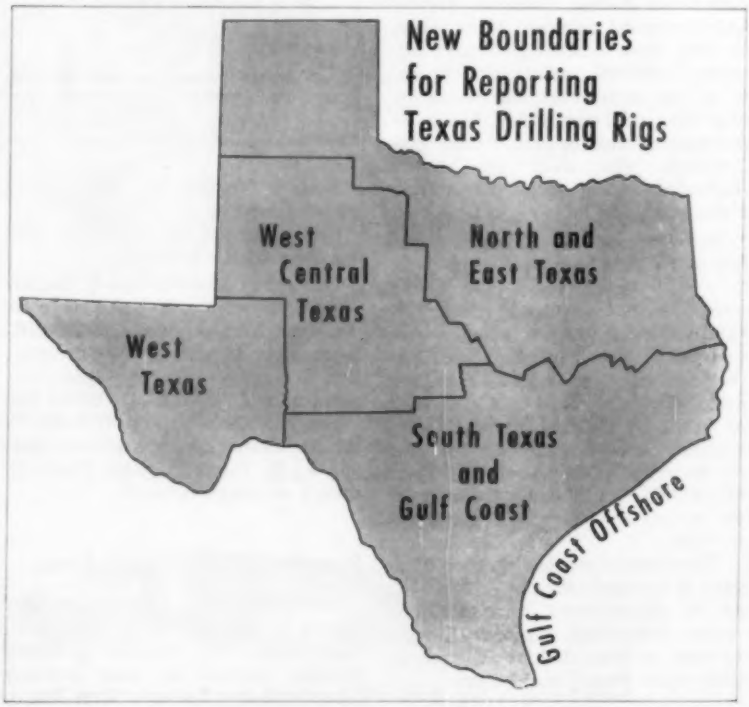
OWNU inroads . . . This is the second attempt by a new independent union to invade plants maintaining contracts with OCAW. The Oil Workers National Union has asked NLRB for bargaining rights at the Aurora Gasoline Co.'s Trenton, Mich., refinery. OWNU claims it had sufficient signed authorization cards to petition for an election.

The new union made its appearance at Trenton shortly before settlement August 27 of an unauthorized OCAW strike against Aurora which began May 15.

No action . . . The stalemate between Sohio and OCAW in negotiations for 1958 contracts is typical of bargaining throughout the oil industry.

The union opened a drive last February for a cost-of-living wage adjustment, an increase of 3.5% to compensate for greater productivity, substantial severance pay for laid-off workers, and longer-term contracts. The wage proposals total 19-21 cents an hour.

The program has been rejected unanimously in the industry. OCAW's top officers will review their goals September 20 at Long Beach 2 days before the union's convention opens.


New Boundaries for Reporting Texas Drilling Rigs
West Central Texas
North and East Texas
West Texas
South Texas and Gulf Coast
Gulf Coast Offshore

Texas Drilling Areas Changed

A NEW ALIGNMENT of reporting districts for active rotary rigs in Texas has been announced by Hughes Tool Co.

Hughes gathers information on rig activity over the nation weekly, and the figures are published in The Oil and Gas Journal's statistical section (see page 162).

The new boundaries for Texas do not change the Gulf Coast or offshore districts, but the other districts are rearranged.

"The new districts bring the drill-

ing figures more nearly in line with drilling activity," Hughes said.

The northern border counties of the South Texas and Gulf Coast district are Val Verde, Edwards, Kerr, Gillespie, Blanco, Burnet, Williamson, Milam, Burleson, Brazos, Madison, Walker, San Jacinto, Polk, Tyler, Jasper, and Newton.

The northern and eastern border counties of the West Central Texas district are Bailey, Lamb, Hale, Floyd, Motley, King, Knox, Haskell, Shackelford, Callahan, Brown, Mills, and Lampasas.

The northern and eastern border counties of the West Texas district are Winkler, Ector, Midland, Upton, western Crockett, and Terrell.

Lion Expanding

and gaining flexibility in El Dorado refinery project.

PLANS HAVE been announced for a multimillion-dollar construction program to expand and modernize the El Dorado, Ark., refinery of Monsanto Chemical Co.'s Lion Oil Division.

The program will increase the refinery's rated crude-oil capacity from 29,000 to 33,000 bbl. per day. It also will permit greater yield, quality, and diversification of products.

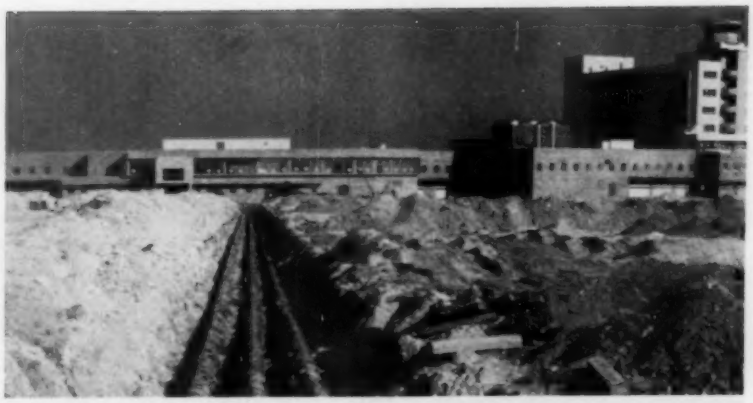
Among the major installations will be new hydrodesulfurization, decarbonization, and tetramer units. The program also will include enlargement of vapor-recovery facilities.

The hydrodesulfurization unit, with a capacity of 5,000 bbl. daily, is designed to improve the quality of diesel fuels and burner oils produced at the plant. New decarbonization facilities, also rated at 5,000 bbl. per day, will increase the yield of paving-grade asphalts through the upgrading of residuals. H. H. Bible, Lion general manager, pointed out that this unit will help the company prepare for the increased demand for paving asphalt which is expected to result from the federal highway program.

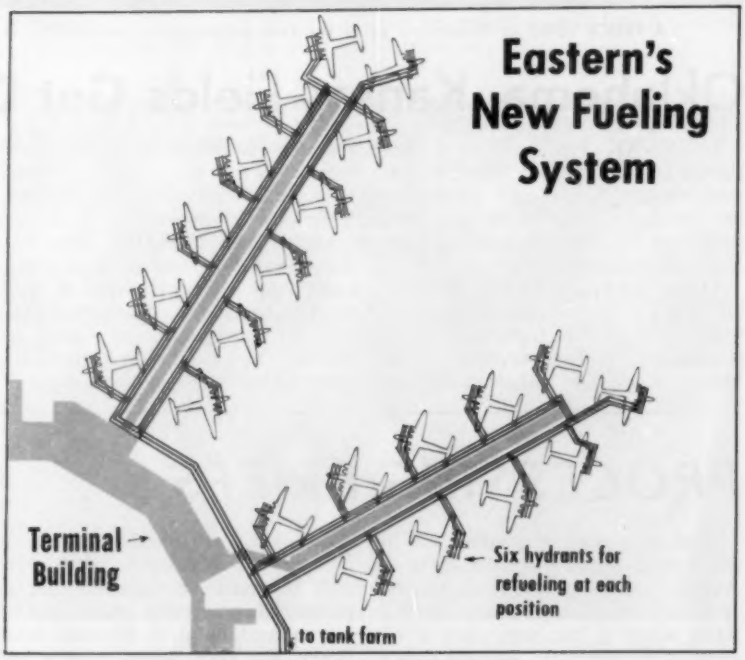
Propylene tetramer, to be produced in the new tetramer unit, is a raw material used by Monsanto's inorganic chemicals division. The expanded vapor-recovery facilities will handle a greater volume of gas and provide the feed stock for the tetramer unit.

The new project will be the second expansion of refining facilities to be started at the plant in recent months. Construction of a 5,000-bbl. per day catalytic reformer, begun last April, is now nearing completion.

Engineering work on the new project has started. Construction is scheduled to be finished early in 1960.



UNDERGROUND lines at Miami airport permits multiple fueling (below).



New System Speeds Fueling

REFUELING TIME for both jet and piston planes will be cut in half by Eastern Air Lines' new fueling system at Miami's International Airport. The underground system has been completed at the terminal, which is expected to be in full operation early next year.

The system is said to be the world's largest. It was designed and built for the jet age which begins for Eastern next month. The airline will receive the first of 40 turboprop Lockheed Electras in October and the first of 20 Douglas DC-8 pure jets in January of 1959.

The system will be able to serve 22 planes simultaneously (drawing). Each position will have six outlets, three for each wing. The multiple outlets will make it possible to load both wings at the same time.

Self-propelled hydrant carts will link the planes and the system. The carts will be equipped with hose, measuring devices, and filters. One 18-in. line will carry jet fuel and two 14-in. lines will carry 100 and 115 octane aviation gasoline.

Storage tanks are located a little more than a mile from the terminal. The piping network adds up to 42,945 ft., more than 8 miles altogether. Present tankage of 2,205,000 gal. will be increased to 5,000,000 gal. when jet service begins. Eastern has invested $1,250,000 in the system.

Orange State Oil Co., an affiliate of Cities Service Oil Co., will supply the fuel.

A TRUCK LOAD of Oklahoma oil is the first delivered to Jayhawk's Meade, Kans., terminal. It means that . . .

Oklahoma, Kansas Fields Get Crude Outlet

JAYHAWK Pipeline Corp. has started taking crude from several southwestern Kansas and northwestern Oklahoma fields which have been hampered by limited markets and high-cost transportation.

Derby Oil Producing Co., Wichita, an affiliate of Colorado Oil & Gas Corp., one of the Jayhawk owners, has started full-scale purchases at the Meade, Kans., terminal. National Cooperative Refinery Association, the other owner of the 242-mile, 10 and 12-in. line terminating near Wichita, is the other major buyer.

Derby plans to bid for 6,000 bbl. daily, half the initial throughput. Crude also will be tendered to Service, Arapahoe, and Continental pipelines for midwestern and eastern refineries. Oil will be trucked to Meade until gathering lines are completed.

Top price posted by Derby is $2.90 per barrel at Meade for 40° to 44.90° gravity. High-gravity oil and condensate, which comprise a large part of the area output, bring 3 cents less per degree from 45° up, stopping at $2.55 for 55° gravity and above. The differential between 39.9° and 36° is 2 cents per degree. A 4-cent penalty begins at 35.9° and holds for lower gravities.

PROCESSING BRIEFS . . .

Average quality of gasoline sold in the United States was unchanged in August, according to Ethyl's monthly survey. Premium remai. ed at 98.5 RON where it has been since a 0.1 increase in February. Regular stayed at 91.2 where it has been since a similar increase in May. Premium was up 0.4 octane number from a year ago and regular 0.3. Premium was in the 98-98.9 octane range in 80% of the 57 cities and regular ranged from 88.0 to 93.4 in 95%.

The Cooperative Farm Chemicals Association of Lawrence, Kans., will add ammonia and urea plants to its nitrogen-producing facilities. The projects, scheduled for completion in August 1959, will be designed and built by Chemical Construction Corp. The ammonia plant will have a rated capacity of 100 tons per day. The urea plant will produce 30 tons of urea per day.

The first commercial plant to make gasoline and high-purity metallurgical coke from a raw material other than crude oil has completed its first year of operation at Gilsonite, Colo. Officials of American Gilsonite Co. reported all processing phases proved out successfully at its $16-million refinery. The plant makes gasoline and coke from Gilsonite ore, a solid hydrocarbon.

Western Canada will get $50-million worth of new processing facilities at two plants next month.

On October 15, British American Oil Co., Ltd., will place on stream its Pincher Creek gas processing plant. Two days later BA's Port Moody refinery near Vancouver, B.C., will go on stream.

Ralph M. Parsons Co. of Canada, Ltd., is building the Pincher Creek plant. Initial daily production capacity will be 65,000 gal. of liquids and 450 long tons of sulfur. Canadian Kellogg Co., Ltd., is building the Port Moody refinery, which will be a 20,000-bbl. plant.

Also for Refiners . . .

IN THE NEWS: Natural gas has arrived as a giant fuel rival for oil, still grabbing off markets especially in heating oils and residual (p. 63) . . . Kellogg survey predicts alkylation is entering its biggest expansion period in history (p. 70) . . . Imports show sharp decline in July, latest statistics reveal (p. 72) . . . Aramco barges a big LPG tank from Holland to its Ras Tanura refinery in Saudi Arabia (p. 86) . . . Esso has let contract for constructing its 100,000-bbl. refinery in Wales (p. 86) . . . Japan may enter the coke market next year if plans are carried out for a 5,000-bbl. delayed coker at the Marifu refinery (p. 87).

PLUS THESE TECHNICAL REPORTS: A new way to measure product in slack lines (p. 88) . . . Capacitance measurement is valuable for process-stream analysis (p. 96) . . . A comparison of gas-purification processes (p. 100) . . . A close look at filiform corrosion (p. 118).

Argentina Assigns Work

. . . under $100-million contract. Development due to start soon in Mendoza. Italians offer financial deal to YPF.

THREE producing structures in Mendoza Province will be developed by Carl M. Loeb, Rhoades & Co. as part of its $100-million contract with Argentina.

The state oil agency, Yacimientos Petroliferos Fiscales, has assigned structures known as La Ventana, Vacas Muertas, and Punta de Barda to the New York investment banking firm. Actual field operations are expected to begin in the near future in advance of the time contemplated in the contract.

Arrangements still are not completed with Loeb, Rhoades associates who will carry out the actual work. The firm is primarily the banker and will depend on experienced oil-production help in the program.

The Loeb, Rhoades contract is one of two recently approved by executive decree of the Argentine Government. The other contract is held by Pan American International (Indiana Standard) and involves a similar development program (OGJ, Aug. 4, p. 70).

The final Loeb, Rhoades contract contains eleventh hour changes made under local political pressure. These give YPF final word in the joint operations committee and authority to designate suppliers.

Loeb, Rhoades will provide all needed capital and assume all risk that output will be high enough to pay out the investment. YPF retains ownership of production and has exclusive right to determine its disposition.

Half the value of every barrel produced will be paid to the investment firm in money, rather than in oil, with value determined by the laid-down price of crude at Argentine ports. This will repay the investment. Another 15% to 20% of the value will be paid to the bank as profit.

The contract includes a procedure by which YPF at its option could buy out Loeb, Rhoades' interest in the development contract before its 20-year term expires. Loeb, Rhoades also has agreed to place 20-year YPF bonds which will finance transportation facilities that may be needed to move additional production.

Nationalization move . . . President Frondizi has sent a bill to the Argentine congress that would nationalize oil resources.

The bill excludes the present small, declining properties of Royal Dutch-Shell, Standard Oil Co. (N. J.), and other private interests. It would not affect the new contracts with foreign companies.

In effect, the bill is a gesture of reassurance to opponents of the new contracts. Individual provinces now hold title to oil resources under guarantee by the constitution. In practice, all five provinces with known reserves have turned them over to YPF.

ENI offer . . . The Italian state oil agency, Ente Nazionale Idrocarburi, is among the latest batch of foreign firms to offer YPF a deal.

ENI has offered to finance 10 to 20 rigs, transportation facilities, and refining equipment. It also would be willing to discuss the construction of an equipment-manufacturing plant in Argentina.

EQUIPMENT is loaded at Houston and will head south as . . .

Argentine Pipelines Started

MILLIONS of dollars' worth of equipment is being shipped through the port of Houston for use in laying two major pipelines in Argentina.

Clearing and grading of right-of-way recently started for the 580-mile crude-oil line and 1,015-mile natural-gas line which will move production from Campo Duran field in northern Argentina to San Lorenzo and Buenos Aires.

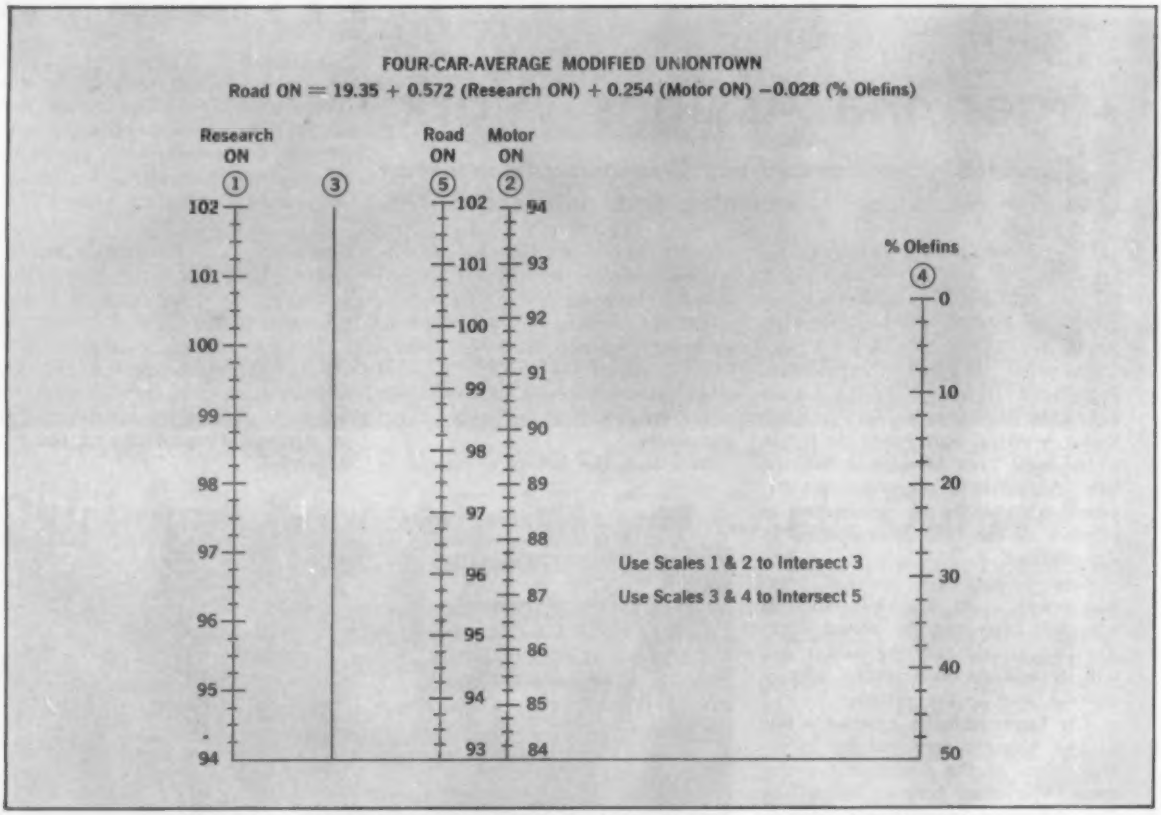
Cost of the two projects will total approximately $180,000,000. Completion is scheduled for early 1961.

Construction is being handled by an Argentine firm known as SARGO. It is the Argentine representative for Fish Engineering Corp., Houston, and North American Utility & Construction Corp., New York. SARGO took over the project after TIPSA, another Argentine company representing the same U. S. firms, had successfully negotiated for the contract.

Contract for laying the northernmost leg of the crude-oil line, a segment about 175 miles in length, was let to a group known as TECHNIT. This group is a combine of Argentine and European companies.

Laying of pipe on the American-built segment of the line is expected to start about October. Small orders of specialty pipe for the project will be shipped from Houston, although most of the pipe will be foreign-made.

The 12-in. crude line will extend from Campo Duran field to the river port of San Lorenzo. The 24-in. gas line will extend to Buenos Aires.


FOUR-CAR-AVERAGE MODIFIED UNIONTOWN
Road ON = 19.35 + 0.572 (Research ON) + 0.254 (Motor ON) −0.028 (% Olefins)
Research ON
Road ON
Motor ON
% Olefins
Use Scales 1 & 2 to Intersect 3
Use Scales 3 & 4 to Intersect 5

Here is an example nomograph for calculating the road antiknock performance of premium fuels.

Ethyl Research establishes new equation coefficients for calculating road octane numbers of 1958 gasolines

Now, road performance can be predicted for both premium and regular fuels, without the expense and time ordinarily used in road-rating programs

LAST YEAR Ethyl Research Laboratories in Detroit developed a system for calculating road performance of premium fuels from routine laboratory tests.

The work was based on a study of samples, from refineries, representing 75 per cent of the premium motor fuel blended in the United States during 1957.

Extensive computer analyses of test data resulted in a general equation with coefficients that can be selected to cover (1) different makes of cars; (2) Modified Uniontown road ratings; and (3) Modified Borderline road ratings at various speeds.

Ethyl Research has now completed the work of bringing these equation coefficients up to date so that road performance of premium and regular fuels can be calculated for a number of 1958 passenger cars.

A Road Performance Equation

Road performance of gasolines can be calculated from this equation:

$$Y = a + bR + cM + dO$$

where Y = Road octane number
R = Research octane number
M = Motor octane number
O = Per cent olefins
and a, b, c, and d are equation coefficients for a particular car and test.

Coefficients for 1958 Cars

Two publications are available to the refining industry.

They are "Road Octane Correlations for Premium Gasolines 1958," covering tests made on four representative cars, and "Road Octane Correlations for Regular Gasolines 1958," covering tests made on three representative cars.

Appropriate coefficients (a, b, c, and d) are reported for each vehicle to facil-

itate calculation of both Modified Uniontown and Modified Borderline (various speeds) road antiknock ratings.

Also included in each report are average coefficients.

Example coefficients and other pertinent information are shown below for a typical 1958 car. (Table I)

Limitations of Equations

Experience with these equations has shown that their use should be restricted to fuels of similar antiknock qualities and hydrocarbon composition to those used in the original program.

This restriction still allows wide latitude of use, however, since full-boiling commercial gasolines representing current grades were used. (Table II)

Although the road octane numbers assigned to gasolines by one vehicle are not necessarily reproducible in other vehicles of the same make and model, experience has shown that *relative* fuel ratings tend to be quite consistent from car to car.

Ideally, therefore, the equations should be used to compare the road performance of gasolines rather than using them to calculate the road octane number of a specific fuel.

The same reasoning also applies to experimental road-rating results.

TABLE I

Equation Coefficients for a Typical 1958 Car

Road ON = a + b (Research ON) + c (Motor ON) + d (% Olefins)

	a	b	c	d	Std. Error
Modified Uniontown	30.75	0.458	0.263	-0.034	0.36
Modified Borderline					
1650 rpm	27.11	0.637	0.111	-0.029	0.48
2000 rpm	23.57	0.491	0.302	-0.022	0.38
2500 rpm	29.50	0.495	0.229	-0.038	0.32
3000 rpm	22.75	0.498	0.289	-0.047	0.36

Octane Number Requirements

	Modified Uniontown	Modified Borderline 1650 rpm	2000 rpm	2500 rpm	3000 rpm
Primary reference fuels	95.9	96.1	94.4	93.3	92.8
Commercial reference fuels	96.5	96.8	95.0	94.3	95.0

TABLE II

Range of Full-Boiling Premium Fuels

Research Octane Number	96-102
Motor Octane Number	85-94
Sensitivity (RON minus MON)	7-14
TEL, ml per gallon	2.0-3.0
Hydrocarbon Type, vol %	
Olefins	5-50
Aromatics	5-50
Saturates	40-80

How Ethyl Research is helping you

In recent years interest has been continuous within the Oil Industry for effective means to calculate road antiknock performance of gasolines.

As a result Ethyl has two current publications directed toward this interest.

1. "Road Correlations for PremiumGasolines1958."
2. "Road Correlations for Regular Gasolines 1958."

These publications are one more example of Ethyl's continuing service to the Oil Industry. Copies can be obtained from your Ethyl Representative or by writing Ethyl Corporation, 100 Fark Avenue, New York 17, N. Y.

ETHYL CORPORATION
New York 17, N. Y.

ETHYL
ANTIKNOCK COMPOUND
ETHYL CORPORATION

RESEARCH LABORATORIES:
1600 W. Eight Mile Road, Ferndale 20, Mich.
2600 Cajon Road, San Bernardino, Calif.

LPG Tanks Start Trek to Middle East

THE LUSH green Dutch countryside is far different from the terrain where this LPG tank will have its permanent home.

The 100-ton, 125-ft. vessel is being barged down a narrow canal en route from a Netherlands' manufacturing firm to Saudi Arabia. It is one of three similar vessels that will be installed at the Ras Tanura refinery of Arabian American Oil Co.

Each of the 9-ft. diameter tanks will have a storage capacity of 50,000 gal. of LPG. They are designed for a maximum working pressure of 250 psi. The vessels and related facilities will be in use by January. 1. They will give Aramco an LPG capacity of 1,500 bbl. daily at a $1,025,000 investment. This will cover local demand and will provide surplus for export.

Caltex Spuds First Libyan Test

A NEW Libyan wildcat is being spudded with remote-control ceremony.

American Overseas Petroleum, Ltd., has set up the novel arrangement so that Libyan government officials in Tripoli will participate in starting a test in Fezzan.

The well is Gebel Uaddan 1, about 230 miles southeast of Tripoli. It is the first try in Libya for the Caltex exploration subsidiary. A formal tape-cutting ceremony at Amoseas' Tripoli office will be broadcast to the rig on a two-way radio hookup. When word is given to turn the bit, the sound of the 2,500-hp. engines and grinding will be relayed back to the party in Tripoli.

Other tests . . . Oasis Oil Co. of Libya (Ohio) is drilling ahead at 1,305 ft. at its second well.

The well is 22 miles south and east of the discovery, the Bahi 1, on the same structure. Its objective is the sand that tested 75 bbl. of crude on a 2½-hour drill-stem test. A 32-ft. pay was topped at 5,822 ft. (OGJ, Aug. 11, p. 90).

Mobil Oil Co. of Canada is rigging up for a test at Wadi ben Guaad on the Mediterranean Coast. The site is 22 miles north of the dry hole at El Hofra.

Several companies have been busy drilling on Fezzan acreage. Cie. Francaise des Petroles is nearing 2,000 ft. in its second wildcat, at Wadi Tahara, 50 miles east of its first try. Esso Standard of Libya has abandoned Geramna 1 at 3,526 ft. as a dry hole. Gulf Oil has abandoned Tiririne 1 at 3,664 ft. after testing salt water.

D'Arcy Exploration Co. is drilling ahead at 2,440 ft. at Wade Zachem in the Giofra area, 180 miles south-southwest of Sirte in Tripolitania. The company is British Petroleum's exploration subsidiary. Anglo-Saxon Petroleum, the exploration subsidiary of Royal Dutch-Shell, is at 3,620 ft. at In Azar 1 on the Fezzan-Tripolitania border. Esso's Syrtica well, Bu Grea 1, is drilling ahead at 8,461 ft.

Contract Awarded

for construction of Esso's 100,000-bbl. Welsh plant.

CONSTRUCTION contract for a 100,000-bbl. "grass roots" refinery at Milford Haven, Wales, has gone to Foster Wheeler, Ltd.

Esso Petroleum, Ltd., the British affiliate of Standard Oil Co. (N.J.), will spend $50 million on the project. The refinery itself will cost more than $35 million. The rest will be spent on other facilities, including a deep-water tanker jetty. Work will take a little more than 2 years.

Esso Research & Engineering is handling process design. Foster Wheeler of London will take care of mechanical design, drafting, and procurement. It also will be in charge of construction of all process units and most onsite and offsite facilities, except tankage and port facilities.

Major process units include a 100,000-bbl. per stream day distillation unit, with a naphtha splitter and stabilizer, and a 16,500-bbl. blocked-operation Powerformer. There also will be a 16,500-bbl. gas-oil Hydrofiner, a 31,500-bbl. gas-oil drying unit (electric coalescer), and copper-chloride sweetening facilities.

The plant will be built on a 350-acre tract on the shore of the deep-water port. A 3,500-ft. tanker jetty will accommodate tankers of 100,000 tons.

Esso Petroleum is expanding its existing refinery at Fawley to 220,000 bbl. Foster Wheeler also has the construction contract for this project. When the Milford Haven and Fawley projects are completed, Esso will be able to supply 37% of United Kingdom demand.

Aminoil Makes Thailand Deal

Most products in a new long-term contract in Thailand will be supplied from the Persian Gulf by American Independent Oil Co.

Aminoil will supply an unspecified amount of fuel oil and other products to Summit Co., which in turn will sell it to the Thai defense ministry. The ministry plans to enter retail marketing, competing with the established companies, Royal Dutch-Shell, Stanvac, and Caltex.

Japan May Enter Coke Market

. . . next year. Koa project would include a 5,000-bbl. delayed coker. Mitsubishi Oil is also making plans.

DOMESTIC petroleum coke manufacturers are due to lose a slice of their export market if Japan's first delayed coker opens next year.

Koa Oil Co. may start remodeling its 3,000-bbl. thermal cracking unit at the 45,000-bbl. Marifu refinery by the end of the year. The company may add a 5,000-bbl. delayed coker. The $1.4-million unit would be completed in a year. Caltex has half interest in the company.

Koa wants to start the project because fuel oil is no longer in short supply for the first time in Japanese refining history. The coker could produce 4,400 tons per month, or more than one-fifth of local demand.

This production will probably cut into the export market of United States refineries. Japanese electrode and carbide manufacturers have been buying petroleum coke from the U. S. at the rate of 250,000 tons per year.

A second delayed coker for Japan is being planned by Mitsubishi Oil Co. for its new Mizushima refinery to be built at the end of next year. Tidewater Oil Co. has half interest in the company.

Other units . . . Japanese refiners have also signed contracts for several other types of units.

Koa Oil will start work this year on a $4.4-million UOP-type fluid catalytic cracker at Marifu. Idemitsu Kosan has awarded a contract for a second Unifiner at its 35,000-bbl. Tokuyama refinery. But construction on the 6,000-bbl. unit is not expected to start until 1960. The refinery has been shut down for several months.

Maruzen Oil Co. has applied to the international trade ministry for permission to build a 4,500-bbl. UOP visbreaking unit at its 10,000-bbl. Matsuyama refinery. Except for a furnace imported from the U. S., all equipment for the $800,000 unit would be made in Japan. Work will start next year if the ministry approves.

Maruzen also has decided to go ahead with a 1,500-bbl. Udex unit for Matsuyama.

Japan Gasoline Co., the local agent for Universal Oil Products, is completing a 1,500-bbl. Platformer for Nippon Oil Co. at the 7,500-bbl. Niigata refinery.

Iran to Extend Products Line

PIPE LAYING is scheduled to begin next week on a 200-mile, 6 and 8-in. extension of the Trans-Iranian products line from Teheran northward to Resht on the Caspian Sea.

The extension will give the Iranian Government an 800-mile products line from the Abadan refinery, on the Persian Gulf, to Russia's back door. The 10-in. segment to Teheran, with capacity of 20,000 bbl. daily initially, was completed in the summer of 1957.

Contractors on the Resht extension are Benson & Montin Construction Co., Oklahoma City; Cheney Construction Co., Seattle; and Merritt-Chapman & Scott. Construction across the desert and mountains of northern Iran will take about 6 months.

WORLD BRIEFS . . .

Malta's first deep test is getting under way with a rig brought in from Sicily by BP Exploration Co., Ltd. Naxxar 2 is located 4 miles northwest of Valletta near a shallow test drilled 3 years ago. The rig is capable of going to 15,000 ft.

A pipeline to a second Russian satellite is being planned. It would feed oil from Soviet fields to East Germany, possibly as part of a petrochemical expansion program. Work on a 600-mile crude line to Czechoslovakia is scheduled to start in 1960.

A new affiliate of British Petroleum Co., Ltd., will hold the parent company's interests in new refineries outside the United Kingdom. BP Overseas Refining Co.'s first assignment is to hold BP's 11% share in a new 65,000-bbl. Turkish refinery. Its partners are Royal Dutch-Shell, Socony Mobil Oil Co., and Caltex.

An Italian company is becoming a partner in an Algerian concession for the first time. Ausonia Mineraria, an affiliate of the Edison group, will participate with the French-owned Petropar in a 730-sq.-mile block in the Taouratine area.

Yugoslavia thinks it can boost crude production to 160,000 bbl. daily by 1965 if the government can afford to sink the necessary capital into the industry. The timetable calls for output of 18,400 bbl. daily by the end of 1961. Present output is 9,200 bbl. daily, up from 7,600 bbl. daily last year.

Petrofina expects to have its new 21,000-bbl. refinery in the Duisberg-Neuenkamp area of West Germany on stream the second half of 1959. It will take feed from the common carrier crude pipeline under construction from Wilhelmshaven to the Ruhr. Purfina Mineraloel Raffinerie, A.G., will operate the plant.

A 2,500-bbl. topping plant has opened at Gela field, Sicily. AGIP Mineraria, the producing subsidiary of Ente Nazionale Idrocarburi, is selling asphalt locally and recirculating light ends to help produce the 7°-gravity crude.

A 600-bbl. alkylation plant will be built at the 28,000-bbl. Nationalist Chinese refinery on Formosa by Badger Manufacturing Corp. It will go on stream early next year. Capacity will be raised to 1,000 bbl. later.

Bids on a proposed government-owned 25,000-bbl. refinery in Thailand have been made by 11 companies from five countries. Royal Dutch-Shell and Standard-Vacuum Oil Co. have each offered alternative plans of building private refineries at their own expense.

Russia's first natural-gas underground storage project is in operation. The Kuibyshev Gas Trust is pumping about 1,059 M.c.f. daily into a nearly exhausted Bashkatovskoye gas well. A second well was scheduled for storage. About 353,140 M.c.f. will be stored in the two wells. The gas will move to Kuibyshev and other cities this winter.

French manufacturing rights on Ideal drilling equipment have been awarded to Ste. Fives-Lille-Cail by National Supply Co. The group will manufacture equipment for the exploration market in North Africa.

China will build a coal hydrogenation plant at newly discovered coal fields near Fushun. It will use Russian equipment in a process said to yield 60 bbl. of products from 100 tons of coal.

Esso engineers have come up with a new way to

Measure product in slack lines

BY OIL LOSS PREVENTION GROUP
Esso Standard Oil Co.

Procedure to measure slack-line air

1. Close tanker line valves. If determination is to be made of quantity of air in barge and tanker lines, open "jumpover" and close valve at head of hill.

2. Check primary air gage to insure that compressor in garage is on and pressure in air feed line is above 110-130 psi.

3. Open primary air valve and close bleeder valves then wait until pressure-reducing valve maintains reduced air pressure at 60 psi. Variation from 60 psi should not exceed 1 lb. plus or minus.

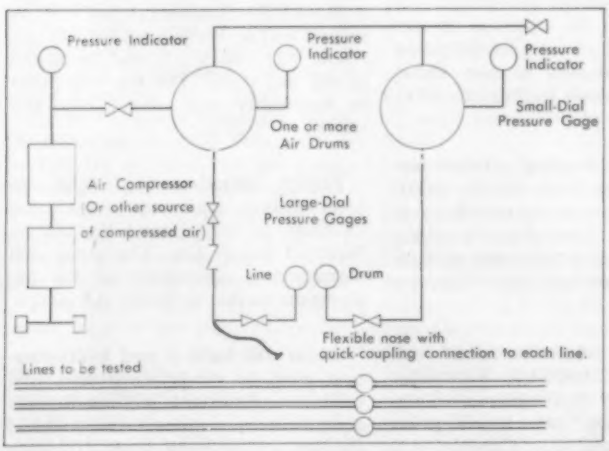
4. Read and record the last three digits of air meter totalizer to determine "before" reading.

5. Note pressure in tanker line before air valve to tanker line is opened.

6. Open air valve and increase pressure in tanker line 10 psi. then read air meter totalizer to determine quantity of air (cubic ft.) necessary to increase pressure in tanker line 10 psi.

7. Reopen air valve and increase pressure in tanker line 20 psi. over original reading; then reread air meter to determine quantity of air necessary to increase pressure a total of 20 psi. If possible repeat operation a third time to increase pressure a maximum of 40-50 psi. (The greater the quantity of air introduced into the line the more accuracy may be expected in calculating slack quantities.)

8. Complete the form and using the chart find the quantity of air in the line for each determination. Average the results and turn the completed form in to the bulk-stock clerk.



AIR DRUM EQUIPMENT used to measure slack in oil lines. Fig. 1.

THE MEASUREMENT of quantities of bulk petroleum transferred by barge and tanker is generally based on "before" and "after" measurements of product in the bulk storage tanks involved. One of the problems associated with the determination of quantities shipped or received has to do with the contents of the pipeline used to deliver the product to or from the storage unit.

Air may be introduced into a line by suction, if product in a tank happens to be at a low level, or by pumping air into the lines during the stripping of barge or tanker compartments. When such a situation exists, the down gage of the shipping tank or the up gage of the receiving tank may not reflect the gallonage transferred, and where the installation involves long lines, the inaccuracy may be substantial.

The product contained in the pipelines used during a particular transfer must be considered, therefore, to arrive at an accurate figure for billing or receipt purposes.

Historical methods . . . Various methods have been used to keep product quantities in a pipeline at a more or less consistent figure. In some instances a tanker or barge would "blow" a line in an attempt to maintain a dry line. Under certain circumstances bleeder valves have been used to allow air to escape and thus maintain a wet line.

Where facilities would permit, product would be circulated through the lines so as to vent the air through the tank and leave the lines full of product. These procedures serve a purpose in some cases, but in others are not practical or economical.

There are few, if any, installations where a line can be blown dry and maintained in an empty condition. The use of bleeder valves to eliminate air and maintain a full line is generally impractical because quantities of air become entrapped in pockets in the line and cannot be released.

At most plants the lack of duplicate pipelines for particular products precludes the possibility of circulating product through the line for the purpose of eliminating air. Even where such a procedure can be followed, this method ties up equipment and is conducive to possible spills and contamination.

Air-Pressure Method

A few years ago a method of calculating the quantity of air in a pipeline was devised whereby a known quantity of compressed air was introduced into the line and the increase of pressure in the line could be used to calculate the quantity of slack (Fig. 1). For this purpose pressure tanks of known capacity were installed adjacent to the pipelines to be measured. After a certain pressure had been built up in the pressure tanks by use of an air compressor, some of the air in the tanks was released into the pipeline.

Before and after pressures were noted for both the pressure tanks and the pipeline. It was found that the ratio of the pressure decrease in the air tank to the pressure increase in the line, multiplied by the volume of the air tank equaled the slack space in the line. Tests on the original installation indicated that the equipment could be used to measure air space in the pipeline to an accuracy tolerance within 10% of the slack quantity.

DETERMINATION OF SLACK IN TANKER LINES

Reduced Pressure maintained at _____ (lbs./sq.in.)

Product: _____

BEFORE RECEIPT OF PRODUCT

	CHECK #1	CHECK #2	CHECK #3
Pressure increase in tanker line (lbs./sq.in.)			
Volume through air meter (cu. ft.)			
Volume of slack in tanker line (gals.)			

AVERAGE _____

Determination made by: _____

AFTER RECEIPT OF PRODUCT

	CHECK #1	CHECK #2	CHECK #3
Pressure increase in tanker line (lbs./sq.in.)			
Volume through air meter (cu. ft.)			
Volume of slack in tanker line (gals.)			

AVERAGE _____

Determination made by: _____

Note: This form is to be prepared in triplicate for every receipt by barge and tanker and turned in to Stock Clerk with barge papers.

THIS FORM is used in determining slack in tanker lines.

Gas meter used . . . During the construction of another large terminal, measurement problems were anticipated due to the possibility of slack in the tanker and barge lines. The length and size of the lines (Fig. 2), while not comparable to some refinery and terminal installations, were sufficient to cause substantial variations in receipt (or delivery) measurements when varying quantities of air remained in the lines.

The capacity of the lines, and the excessive size of air-pressure tanks which would be needed for slack measurement, obviated the possibility of this type of installation. Therefore, an adaptation of the principle used in the original test was planned, and a gas meter, along with pressure-regulating equipment, was substituted for the pressure tanks.

The installation (see Fig. 3) consists of a 4-in. large-capacity gas meter, between a 10-hp., 40-c.f.m. air compressor and the pipelines to be measured. Pressure regulators, set at 60 psi., were placed in the air line on both the intake and discharge sides of

TABLE 1—SLACK LINE TEST FOR NEW TANKER TERMINAL

	Start	Trial 1	Trial 2	Trial 3	
LP*	24	44	....	....	Increase of 20 psi.
MR†	230	238	....	....	By adding cu. ft. air
MP‡	60	60	....	....	Shows no slack in line
490 gal. product drawn from line:					
LP	0	10	20	30	At 10 psi. var. of 30 gal. or 6% minus
MR	238	245½	254	263	At 20 psi. var. of 50 gal. or 10% minus
MP	60	60	60	60	At 30 psi. var. of 50 gal. or 10% minus
Calculated slack, gal.	....	460	440	440	....
492 gal. drawn from line—total slack 982 gal.:					
LP	1	11	21	....	At 11 psi. 182 gal. var. of 18% minus
MR	263	277	294	....	At 21 psi. 142 gal. var. or 14% minus
MP	60	60	60	....	....
Calculated slack, gal.	....	800	§840	....	....
1,080 gal. drawn from line—total slack 2,062 gal.:					
LP	0	10	20	25	At 10 psi. 122 gal. var. or 6% minus
MR	315	350	385	404	At 20 psi. 97 gal. var. or 5% minus
MP	60	60	60	60	At 30 psi. 42 gal. var. or 2% minus
Calculated slack, gal.	....	1,940	1,965	2,020	....

*LP—Line pressure in psi. †MR—Meter reading in cu. ft. ‡MP—Meter pressure in psi. §Adjusted pressure regulator across meter.

	TANKER LINES			BARGE (AND RACK) LINES				
	Length (ft.)	Size (in.)	Capacity (gal.)	Length (ft.)	Size (in.)	Capacity (gal.)	Capacity (gal.)	Total Capacity (gal.)
Housebrand Motor Fuel	1,530	14	10,960	895 1,835	12 8	5,259 4,769	10,028	20,988
Premium Motor Fuel	1,320	12	7,756	715 1,825	12 8	4,201 4,743	8,944	16,700
Kerosine	1,380	12	8,108	585 1,795	10 8	2,396 4,665	7061	15,169
Heating Oil	2,475	16	23,485	1,610 1,820	12 8	9,640 4,730	14,190	37,675
Diesel Oil	1,125	10	4,609	2,315	8	6016	6016	10,625

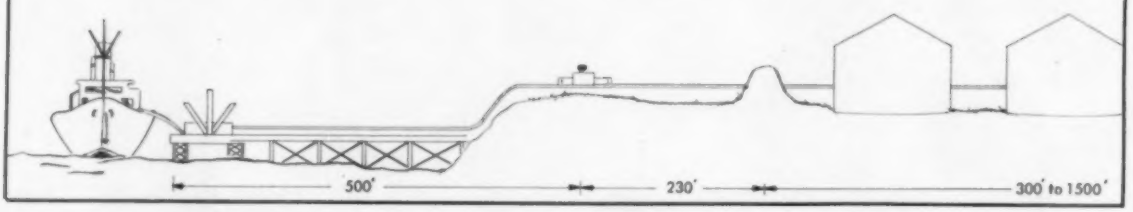
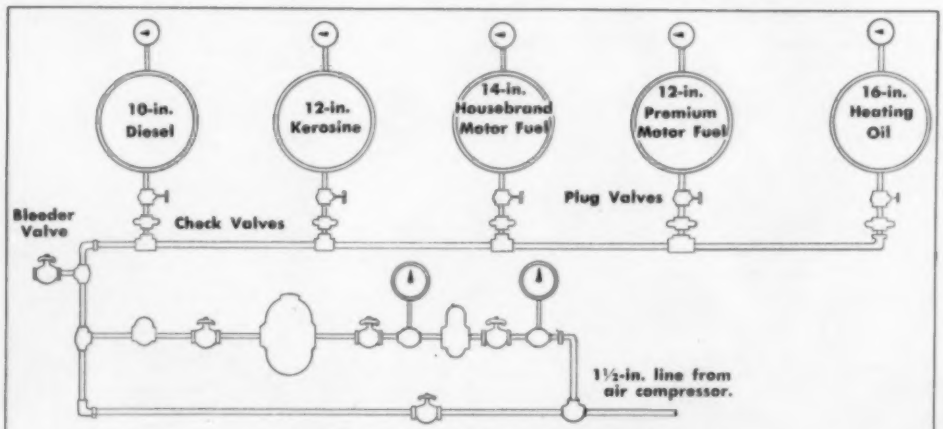


DIAGRAM showing tanker and barge lines from tank field to tanker. Fig. 2.



1. Air Meter—4-in. large-capacity gas meter. Max. working pressure—100 psi.
2. Air Compressor—10 hp. 40-c.f.m. displacement. 120-gal. tank.
3. Regulator—2-in. regulator. 5-60-psi. outlet pressure set for 60 psi.
4. Pressure Gage—0-75 psi.
5. Pressure Gage—0-200 psi.
6. Pressure Gage—0-100 psi.

Note: Size of gas meter, regulators, valves, and lines can be reduced. If smaller gas meter is used pressure should be reduced accordingly so that working pressure does not exceed meter maximum.

MEASURING equipment for slack lines. Fig. 3.

the meter. Pressure gages were installed on both sides of the regulator on the intake side of the meter for checking and adjustment purposes.

Additional pressure gages in the pipelines and the necessary valves and piping, completed the installation. The discharge side of the gas meter is connected to all pipelines by a permanent air line, and the flow of compressed air can be directed to any particular line by setting the proper valves.

To measure the slack in a line the compressor is started and the pressure meter (No. 5 on Fig. 3) is checked to insure that sufficient pressure has been built up for the test. The bleeder valve on the discharge side of the gas meter is opened, as are the plug valves on both sides of the meter, thus allowing the air to run through the meter and out of the bleeder valve.

A check of the pressure gage (No. 4 on Fig. 3) should show that the pressure regulators are working properly and are holding the pressure through the meter at 60 psi. The valves are then closed.

A notation is made of the pressure-gage reading on the pipeline to be measured, and a record is made of the reading of the gas meter counter. The air-line valve to the particular pipeline and the plug valves on both sides of the meter are opened to allow the compressed air to enter the pipeline.

The air is permitted to run through the meter until the pressure gage on the pipeline shows the desired pressure increase, preferably, 10 psi. or more. When the desired pressure has been reached, the valve on the pipeline is closed, the valve on the intake side of the meter is closed, and a reading is taken from the meter counter.

The total cubic feet of compressed

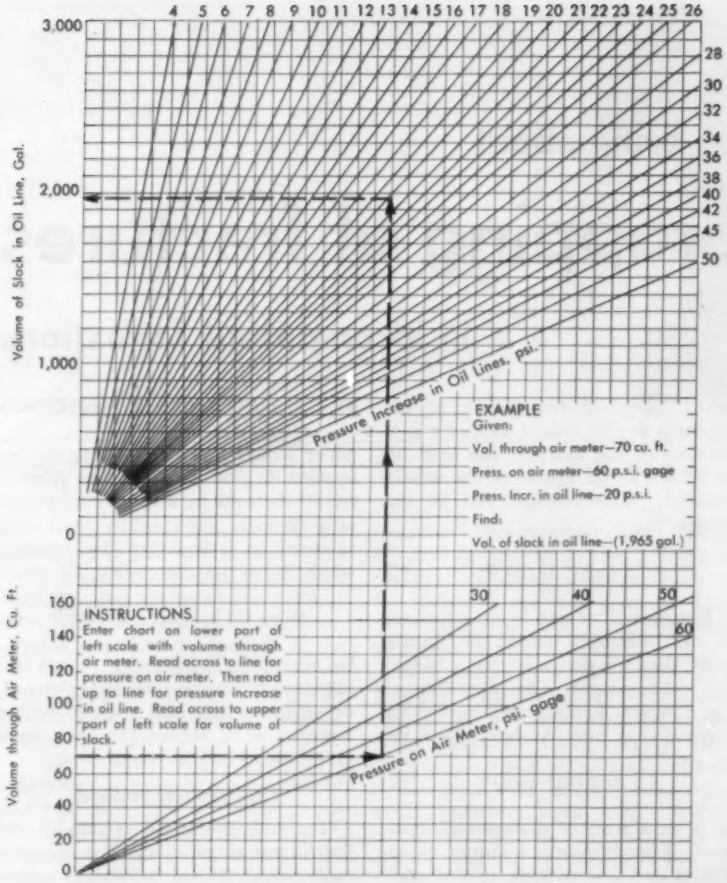

Volume of Slack in Oil Line, Gal.
Volume through Air Meter, Cu. Ft.
Pressure Increase in Oil Lines, psi.
Pressure on Air Meter, psi. gage
EXAMPLE
Given:
Vol. through air meter—70 cu. ft.
Press. on air meter—60 p.s.i. gage
Press. Incr. in oil line—20 p.s.i.
Find:
Vol. of slack in oil line—(1,965 gal.)
INSTRUCTIONS
Enter chart on lower part of left scale with volume through air meter. Read across to line for pressure on air meter. Then read up to line for pressure increase in oil line. Read across to upper part of left scale for volume of slack.

CHART for determination of slack in oil lines. Fig. 4.

air going through the meter during the test, the 60-psi. working pressure, and the increase in line pressure are included in a formula, or, in actual practice, are applied to a chart to determine the quantity of space in the line taken up by air (see Fig. 4).

Accuracy good . . . An initial test of the equipment indicated a maximum error of 9%, however, as a result of the test, several improvements were recommended in the installation. Hand valves had been used to regulate the pressure through the meter, and, since it was found to be difficult to maintain a constant pressure in this manner, the use of the pressure regulators (No. 3 on Fig. 3) was recommended. The test also indicated that, for the best results, slack determinations should be made with at least a 10-psi. increase in oil-line pressure.

The pressure regulators were installed and a further test was conducted. The details of this test are recorded in Table 1. After a preliminary check showed no slack in the heating-oil tanker line, known quantities of product were withdrawn from the line into a tank truck. At intervals the slack-line equipment was used to determine the slack at various pipeline pressures.

During the introduction of air into the line (following the first two product withdrawals) it was noted that the pressure gage on the intake side of the gas meter was reading off scale on the high side. This would indicate that the regulator was in need of adjustment and would account for the variations of 10 to 18% between the gallons withdrawn and the calculated slack in the line. The pressure regulator was adjusted before the final product withdrawal and variations were reduced accordingly.

"The slack-line equipment has been in use at the new terminal since the conclusion of the test and has given satisfactory results."

Conclusions

1. This equipment and procedure may be used to calculate the amount of slack in the shore lines and, if properly adjusted and used, the resulting figure should be well within an accuracy tolerance of 10% of the quantity of air in the lines.

2. It is important that the pressure regulator on the intake side of the gas meter and all pressure gages be adjusted and in proper working condition, in order to obtain accurate results.

3. Larger pressure increases in the pipeline will permit greater accuracy in calculating slack quantities. It is recommended that in no case should the pressure increase in the line be less than 10 psi. Where practicable, 20 or 30-psi. increase is recommended. Gas meter-counter readings in increments of 10, 20, and 30-psi. line-pressure increase, provide an easy means for checking calculations.

The slack-line equipment has been in use at the new terminal since the conclusion of the test and has given satisfactory results. The procedure is easy to follow, the equipment requires little maintenance, and the resulting measurements permit a closer control over quantities received and delivered.

This type of installation should be useful at any refinery or plant where pipeline-product quantities are a problem; however, the following observations and precautions should be considered:

1. The introduction of air into pipelines in kerosine or jet-fuel service is not recommended, due to the possibility of a buildup of static electricity in the tanks or carriers eventually receiving these products.

2. To obtain accurate results, pressure must be retained on the line to be measured for a period of time. This method of slack measurement will not be adaptable to lines where pressure is lost due to leaky valves or other conditions.

3. Where line capacities are considerable, the use of a gas meter will probably be more practical than air-pressure tanks.

4. Pressure gages should have large dials and scales subdivided to a maximum of 2 psi. for accurate reading. Wherever possible subdivisions of 1 psi. would be desirable.

5. The use of this equipment will not insure against discrepancies between vessel and shore quantities due to errors in gaging or temperature determination in the vessel or shore tanks. It will, if properly used, eliminate one important source of discrepancy in the comparison of these figures.

These pointers can help bring about

Successful propping of fractures

in incompetent formations

BY J. L. HUITT AND B. B. McGLOTHLIN

HIGH OVERBURDEN PRESSURE will cause an induced fracture to collapse. This is the result of (1) crushing of the grains of propping sand or (2) complete embedment of the sand grains in the formation. These conditions are shown in Figs. 1 and 2. Here is a method of evaluating a formation to determine if embedment might occur, and a way to prevent it.

Compare with metals . . . In this study, the embedment of sand into a rock formation was considered to be similar to the penetration hardness test for metals. The empirical relation given by Meyer, and later developed theoretically by Tabor for the penetration of a flat metal specimen by a rigid sphere should apply. This relation states that the ratio of the diameter of the impression made by a penetrating sphere in the surface of the specimen to the sphere diameter is a function of the ratio of the load on the sphere to the square of the sphere diameter. This relation can be expressed by:

$$d/D = B^{1/2} (L/D^2)^{m/2} \qquad (1)$$

In Equation 1 m and B are constants for each specimen, and as used in this study, they are constants for a formation core sample. The geometry of Fig. 3 shows that the diameter of the impression d may be determined by:

$$d = 2 (hD - h^2)^{1/2} \qquad (2)$$

for a sand grain of diameter D if the depth of penetration h is known. Equations 1 and 2 were basic in this study since h could be determined experimentally for various values of L and D. In turn, if the theory were correct, a plot of d/D vs. L/D^2 on log-log paper would make it possible to determine m and B which are properties of the rock in which the propping sand embeds. These values could then be used in calculating the fracture width W by the expression:

$$W = D [1 - B (P_c/nD^2)^m]^{1/2} \qquad (3)$$

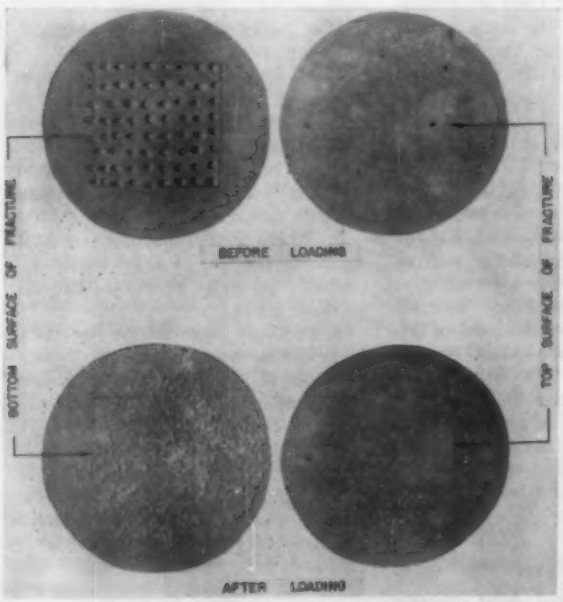
In obtaining Equation 3 it was assumed that propping sand is spherical, of uniform size, and present in the fracture as a monolayer with each grain supporting an equal load.

Experimental Methods

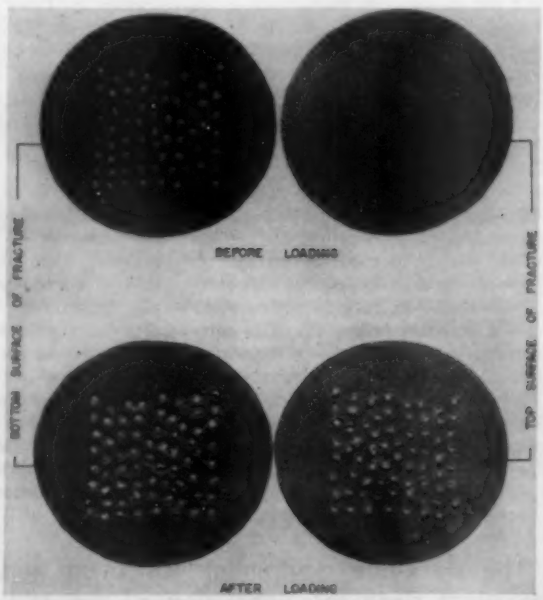
The embedment theory should hold for formations in which the propping sand would embed completely rather than crush when sufficient overburden load was placed on the propping sand.

Selection of samples . . . Formation

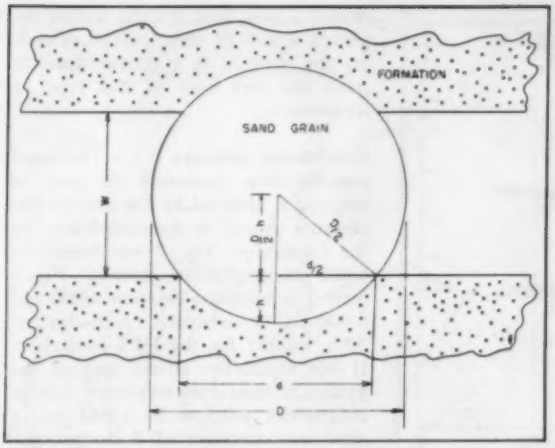
Authors are with Gulf Research & Development Co., Pittsburgh. Paper presented at API production division meeting, Los Angeles.



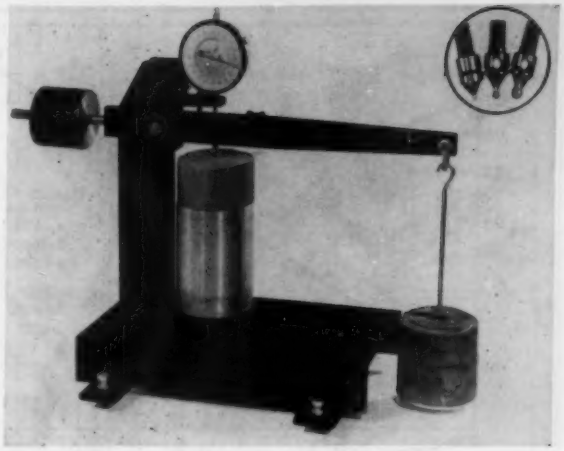
CRUSHING of 12-mesh Ottawa sand under 1,500-psi. overburden pressure. Fig. 1.



EMBEDMENT of 12-mesh Ottawa sand under 1,500-psi. overburden pressure. Fig. 2.



GEOMETRY of embedment. Fig. 3.



BALL-POINT penetrometer. Fig. 4.

cores were broken (parallel to the bedding plane) and several sand grains (10-20 mesh Ottawa-type sand) were placed between the two pieces. These pieces were then placed in a hydraulic press and forced together. If the sand was embedded rather than crushed, additional core samples of the formation were used for embedment tests.

Apparatus . . . An accurate method of measuring the actual depth of embedment under various loads was needed. It was decided to use a steel ball instead of a sand grain so that the depth measurements would be more precise. The apparatus used to apply the load to the ball point is shown in Fig. 4. The depth of penetration could be measured to the nearest ten-thousandth of an inch under loads up to 125 lb.

Preparation of core samples . . . Each core sample was shaped to form a right circular cylinder. A notch was cut around the sample about midway between the ends, and the sample was broken along the notch into two "halves." This provided samples with fresh fracture surfaces parallel to the bedding planes. The sample was then ready for the penetrometer test.

Test procedure . . . At the beginning of a test, the height of the sample was adjusted to level the beam on the ball-point penetrometer. The dial indicator was set on zero when the ball point rested on the fracture surface under zero load. A weight was added to the pan and the reading when the indicator came to rest was taken as the total deformation under that particular load. The load was increased in increments depending on the sample and ball-point diameter, and the deformation was read after each load increase. This procedure was repeated until the ball point had penetrated the core sample to a depth equal to the radius of the ball point or until the maximum load was reached, whichever occurred first.

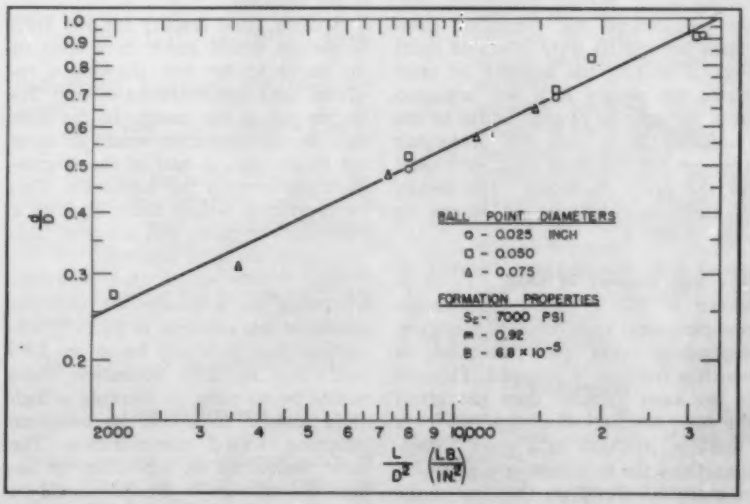
Each sample was subjected to five tests for a particular ball-point diameter. These tests were weighted equally in determining the average total deformation for a given load and ball point. Four sizes of ball points were used: diameters were 0.025, 0.033, 0.050, and 0.075 in. They were made of tool steel and are shown in Fig. 4.

Treatment of Experimental Data

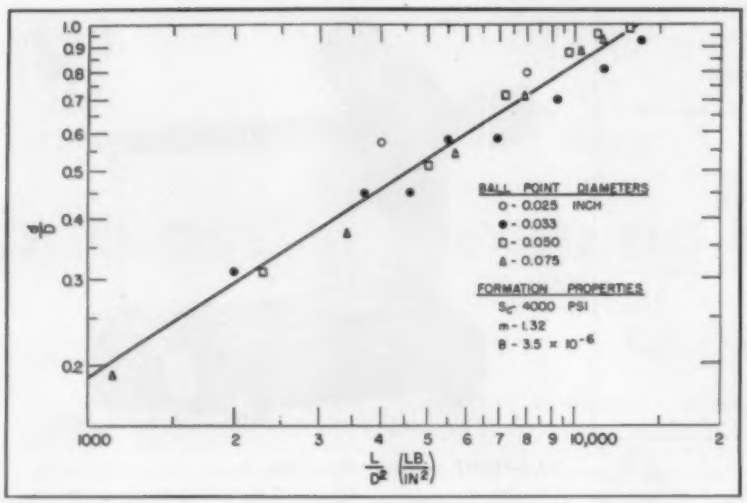
Core samples from nine different formations (without regard for lithology) were tested. Data on core samples of two formations which react differently with regard to the amount of propping sand required were chosen as being typical. One formation represents the type in which a fracture could be propped with sand concentrations commonly used. This will be referred to as an "LPS" formation (low-propping sand). The other formation represents the type in which sand concentrations commonly used are inadequate, and it will be referred to as an "HPS" formation (high-propping sand).

The depth of penetration, load, and ball-point diameter were used in Equation 2 to determine the diameter of the impression made in the core sample. This value was then used to calculate the d/D ratio which was plotted versus L/D^2 as shown in Figs. 5 and 6. Lines were drawn through the data points and were used to obtain the values of m and B in Equation 1.

Since m and B are characteristics of the formation, the plots shown in Figs. 5 and 6 are different. The fact that the data points fell in a straight



EFFECT of load and grain diameter on propping-sand embedment, low-propping-sand formation. Fig. 5.



EFFECT of load and grain diameter on propping-sand embedment, high-propping-sand formation. Fig. 6.

line was considered sufficient to validate the relationship proposed in Equation 1 for the embedment of the propping sand in the formation.

Effect of Variables

In calculating the width of a propped fracture resulting from the propping-sand embedment, a number of conditions have to be assumed. In this study, it was assumed that the sand was spherical and of uniform size, a monolayer was spread evenly throughout the fracture, and the effective weight of the overburden was transmitted equally to all grains.

For the limiting case in which the fracture width is equal to the diameter of the sand grains during the injection and there is no fluid lost to the formation, Equation 3 was used to calculate the width of fracture resulting under various conditions. For the calculations the formation constants (m and B) were obtained from Figs. 5 and 6, the number of sand grains per square inch was obtained from the amount of sand added to the fracturing fluid, and the arithmetic averages for the mesh sizes were used for the grain diameters. The results of these calculations are shown in Figs. 7 and 8.

Size and amount of sand . . . It is shown in Fig. 7 that the minimum propping-sand requirements can vary, depending upon the formation in which a fracture is propped. The size of the sand particles does not affect the sand concentration required for a "hairline" fracture in a given formation. Once the minimum concentration is exceeded, however, the size of the sand has a marked influence on the width of the fracture. This point is significant, since the permeability of the fracture is proportional to the fracture width.

Fluid leakoff . . . The particular formation represented as HPS in Fig. 7 would require a minimum sand concentration of 6.8 lb. per gal. A higher concentration would be necessary for the fracture to be propped adequately. The pumping of fracturing fluids containing sand concentrations such as indicated by this plot for the HPS formation would be very difficult. However, sand concentrations higher than those usually maintained in the fracturing fluid at pumping equipment are obtainable in the fracture by reason of fluid leakoff. The fluid lost from the fracture to the formation during the injection has the net result of increasing the sand concentration within the fracture.

A 50% fluid leakoff for the HPS formation would result in a shift of the curve to the left, showing a required sand concentration of only 3.4 lb. per gal. at the pump. In the fracture, the concentration would go up to 6.8 lb. per gal. as half of the fracturing fluid invaded the formation. This concentration would result in only a "hairline" fracture, and a higher concentration would be desirable.

Fig. 7 also shows that hydraulic fracturing as a production stimulus would be less effective in an HPS formation than it would be in an LPS one. For an LPS formation there would be no value in allowing a high fluid leakoff to obtain an adequate propping-sand concentration. The sand concentration sufficient to insure the fracture is propped could be maintained at the pumping equipment. In addition, an additive which prevented a high fluid leakoff during injection would be beneficial in extending the fracture to a greater distance from the well bore in this type of formation.

Overburden pressure . . . The sand concentration necessary to prop a fracture is affected by the overburden pressure as well as the competency of the formation. Fig. 7 was based on 6,000-psi. overburden pressure. Fig. 8 gives a comparison between 4,000 and 6,000-psi. overburden pressures at 50% leakoff for the HPS formation. If this formation at the time of the hydraulic fracturing treatment had an overburden pressure of 4,000 psi., a sand concentration of 3 lb. per gal. should give a fairly large fracture. However, in the later life of the reservoir, if the effective overburden pressure reached 6,000 psi., due to a decline in formation pressure, the fracture would close. Thus, the sand concentration used in a fracturing job should be sufficient to prop the fracture under the overburden pressure expected in the later life of the reservoir.

Fig. 8 also shows the advantage of using large-size propping sand.

Conclusions

In fracturing a formation in which the propping sand will embed, rather than crush, consideration must be given to the competency of the formation, the size and concentration of the propping sand, fluid leakoff, and the overburden pressure.

It is concluded that:

1. The use of the relationship

$$d/D = B^{1/2} (L/D^2)^{m/2}$$

to describe the embedment of propping sand in formations is valid.

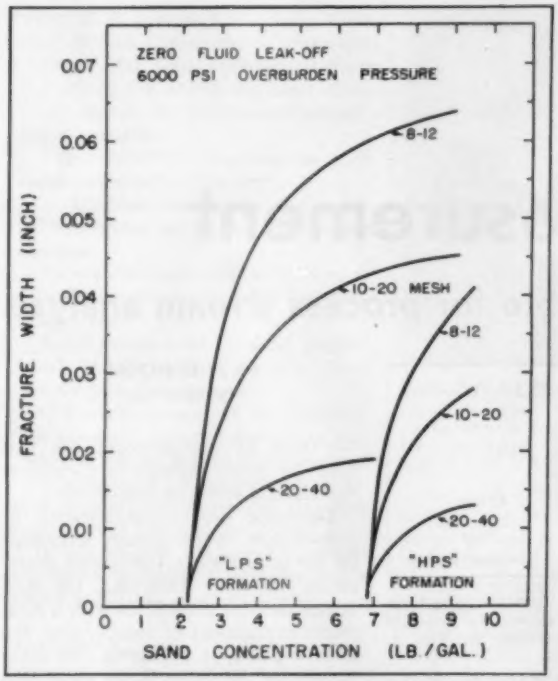
2. The measure of the ability of these formations to sustain a propped fracture can be determined for various overburden pressures and sizes and concentrations of propping sand.

3. In designing the mechanics of a hydraulic fracturing operation, the ability of the formation to resist embedment should be considered in determining the size and concentration of the propping sand and control of the fluid leakoff conditions.

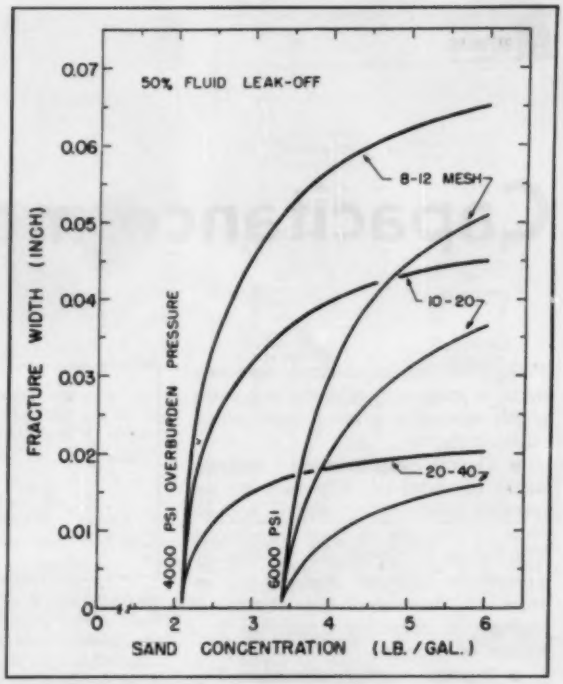
APPENDIX

Equations for Describing Propping-Sand Embedment and Fracture Width

The study of Meyer showed that the penetration of a flat metal specimen by a loaded rigid sphere could be described by the relationship:



EFFECT of size and concentration of propping sand on fracture width. Fig. 7.



EFFECT of overburden pressure, size, and concentration of propping and on fracture width. Fig. 8.

$$L = bd^e \qquad (A\text{-}1)$$

It was also shown that e was independent of the sphere diameter and that b was related to the sphere diameter by:

$$b = c/D^{e-2} \qquad (A\text{-}2)$$

By combining Equations A-1 and A-2 there results:

$$L/D^2 = c\,(d/D)^e \qquad (A\text{-}3)$$

where c and e are constants for the metal in which the penetration takes place. Tabor, by applying the relationships of yield stress and strain for plastic flow, showed that Equation A-3 was a special case of the general equation:

$$L/D^2 = f\,(d/D)^e \qquad (A\text{-}4)$$

for describing the penetration of a metal specimen by a rigid sphere. For the range of the variables used in this study, f is a constant; thus, Equation A-4 reduces to A-3.

If it is assumed that propping agents are rigid spheres and that they embed in a fractured formation by the same mechanism as a rigid sphere embeds into metal, Equation A-3 should describe the embedment. For this study a rearranged form of Equation A-3:

$$d/D = B^{1/2}\,(L/D^2)^{m/2} \qquad (A\text{-}5)$$

was very useful.

By geometry the relation of depth of penetration, h, to the diameter of the impression, d (see Fig. 3), is given by

$$d = 2\,(hD - h^2)^{1/2} \qquad (A\text{-}6)$$

If the sand grains are considered spherical, and uniformly distributed as a monolayer over a horizontal fracture surface, the propped-fracture width can be determined by:

$$W = (D^2 - d^2)^{1/2} \qquad (A\text{-}7)$$

or:

$$W = D\,[1 - (d/D)^2]^{1/2} \qquad (A\text{-}8)$$

Substituting Equation A-5 into A-8 gives:

$$W = D\,[1 - B\,(L/D^2)^m]^{1/2} \qquad (A\text{-}9)$$

If the load per sand grain, L, is replaced by the effective overburden pressure, P_e, and by letting n equal the number of grains of propping sand per square inch of fracture surface, the equation for the propped-fracture width becomes:

$$W = D\,[1 - B\,(P_e/nD^2)^m]^{1/2} \qquad (A\text{-}10)$$

List of Symbols

a = contact area between grain of propping sand and formation (one surface)
b = a constant
B = a constant which is characteristic of the formation
c = a constant
d = diameter of the impression resulting from a sand grain embedding in a formation
D = grain diameter of propping sand
e = a constant
f = letter denoting a function
h = depth of propping-sand embedment in a formation
L = load
m = a constant which is characteristic of the formation
n = number of sand grains per square inch of fracture (one surface)
P_o = pressure resulting from the weight of the overburden
P_f = formation pressure
P_e = effective overburden pressure (pressure exerted because of overburden weight minus formation pressure)
S_c = crushing strength of a formation core sample under compressive load
W = fracture width

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Capacitance measurement

is valuable for process stream analysis

BY F. E. MOORE
Foxboro Co.

THE USE of capacitance measurement in process monitoring is proving highly successful in many applications, particularly:

- **Octane - improvement analysis,** made on catalytic reformers to determine operating conditions and effects of changes in these conditions. The recently developed octane-improvement analyzer enables the refiner to determine the effects of changes in operating conditions in a matter of minutes.
- **Pipeline-interface detection.** This enables the pumping-station operator to switch product streams with a minimum of contamination.
- **B. s. and w. monitoring** of crude-oil streams. Capacitance measurement is particularly effective here because of the difference in dielectric constants.

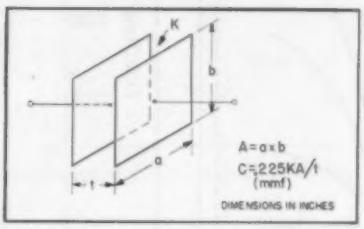
In addition to these and other uses, capacitance measurement is being used to determine toluene concentrations in hydroformer distillates, oil content of the wax stream from a solvent-dewaxing plant, total aromatic content of charge to sulfur dioxide-extraction unilt, propane-oil ratio in a lube-dewaxing process, improvement in viscosity index obtained in a lube solvent-extraction unit, and purity of an acetylene.

The success of existing installations suggest that the principles involved in measuring capacitance in process streams can be used to monitor even more processes than at present.

What it is . . . What is capacitance and how can it be useful in process monitoring? Simply stated, capacitance is a measure of the electrical size of a capacitor; a capacitor being two plates separated by an insulating material called the dielectric. The capacitance of a capacitor, as shown in Fig. 1, is a function of the plate spacing, the area of the plates, and the factor K.

The factor K is the dielectric constant, as inherent a property of a material as density, refractive index, boiling point, or molecular structure.

Paper presented at WPRA meeting, Houston, 1958.



CAPACITANCE of a capacitor is a function of the plate spacing, the area of the plates, and the factor K. Fig. 1.

It is possible to use variations of this property as an analytical tool. In fact, in many instances, dielectric constant can be used to a greater advantage for analytical purposes than any other property of a material.

For a vacuum, K equals unity; for gases, K is essentially equal to unity (air is 1.000585 and hydrogen is 1.000264); and for liquids, K can be as high as 80 (water). In general, symmetrical molecules, such as carbon tetrachloride, benzene and most hydrocarbons are nonpolar, and therefore, tend to have low dielectric constants. Unsymmetrical molecules, such as methanol, nitrobenzene, and water, being polar, have high dielectric constants.

The dielectric constant of a material varies with the temperature, pressure, and measuring frequency. In ordinary process applications, the variation in pressure has an insignificant effect on the dielectric constant. Also, since measurements are made at a fixed frequency, the variation in frequency is of little concern.

Temperature, on the other hand, is almost always a significant variable. Dielectric constant variations from as low as .05% change per °C. to as high as 2.0% per °C are not uncommon. It is necessary, therefore, to take temperature into account when measuring dielectric constant.

Losses . . . Of course, the measurement of dielectric constant cannot be considered a cure-all for the analyst, but is valuable when it provides readings sensitive enough for process analysis. Limiting the sensitivity of this type of measurement are two kinds of losses possible in capacitors —dielectric loss and leakage loss.

Dielectric loss, a characteristic of polarization, is the energy expended by the molecules in reorienting themselves. In some dielectrics, the molecules reorient themselves with a minimum expenditure of energy; thus, the dielectric loss is negligible. In other dielectrics, the loss is so great that it reduces the capacitance significantly.

Leakage loss occurs when some dielectrics permit electrons to flow through them from one plate to the other. A good "rule of thumb" is that capacitance measurements of materials with conductivities greater than 0.1 micromho per cm.^{3} may give questionable results.

Experiments necessary . . . It is difficult to predict, without testing, whether or not dielectric constant is a satisfactory tool for a particular analysis, because not too much is known about what might be called dielectric constant blending properties, except in regard to water-oil emulsions.

Complex interautomatic and intermolecular relationships exist, making necessary an experimental determination of the correlation between concentration and dielectric constant.

The two essentials of a capacitance-measuring system are the capacitor and the measuring circuit. The capacitor, or capacitance cell, gives a fixed change in capacitance for a fixed change in dielectric constant. The ratio of these changes is called the cell factor. The cell factor for any cell can be determined by measuring its capacitance in air and then in a liquid of known dielectric constant.

All capacitance cells have an inherent cell capacitance which is independent of the dielectric material. Since the total capacitance of the cell is the sum of the inherent cell capacitance and the capacitance resulting from the dielectric constant of the

material, it is desirable to keep variation of the former to a minimum.

Short and rigid connections from the cell to the measuring head effectively reduce the inherent cell-capacitance variations.

Other features important to good capacitance-cell design are:

1. Thermal and mechanical stability to prevent misleading capacitance changes.
2. A sufficiently large cell factor to provide sensitive readings by the measuring circuit.
3. Elimination of all dead pockets which could interfere with fresh sampling of the material.
4. Corrosion-resistant construction. The measured material should not corrode the cell or adhere to its surface.

It is important when water in emulsion is being measured that the flow rate through the cell be greater than 5 ft. per second. At lower velocities variations in rates of flow can cause minor variations in capacitance.

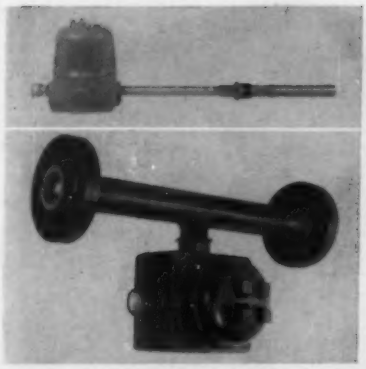
Available designs . . . Fig. 2 shows some of the capacitance-cell designs available for process-stream use.

The other main component of a capacitance-measuring system, the measuring circuit, contains the capacitance being measured and a reference circuit. There are almost as many theoretical circuits for measuring capacitance as there are circuit designers. Several types of measuring equipment are commercially available, but one, measuring at a high frequency, has been used with noteworthy success.

In this circuit the capacitance measurement is made at a relatively high frequency (1.6 mc.) so that it is independent of the resistance effect of dielectric losses common at low frequencies. If a frequency somewhat higher than 1.6 mc. were used, polarization would tend to decrease, with a resulting decrease in dielectric constant. This decrease would reduce the change in dielectric constant per unit change in concentration, thus making the analysis less sensitive.

Although it is very desirable to sense the capacitance at a high frequency, the remainder of the measuring instrument can be designed and operated more simply at 60 cycles. The measured capacitance is converted to a voltage and enters a bridge circuit, as shown in Fig. 3.

Voltage measurements . . . The voltage from the measurement and a reference voltage make up two arms of the bridge, the other two arms being a fixed capacitor and a variable capacitor. When the reference and measurement voltages are identical



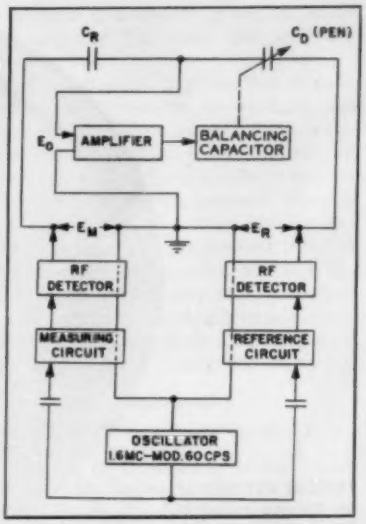
CAPACITY-MEASURING element with measuring-head unit is shown at top. At bottom is liquid dielectric element for use with capacity instruments. Fig. 2.

and the two capacitors are equal, the bridge circuit is balanced and there is no voltage across its terminals.

With a change in the measured capacitance, the measurement voltage increases or decreases, unbalancing the bridge circuit. This bridge unbalance results in an output voltage which is amplified to positon the variable capacitor in a direction to rebalance the bridge circuit.

A pen, linked directly to the variable capacitor, records the changes in the measured capacitance.

Since temperature changes can affect the dielectric constant of the measured material, one of two convenient methods should be used to correct for these changes. In some applications, where the sample flow rate is low and through small lines, the temperature of the sample stream



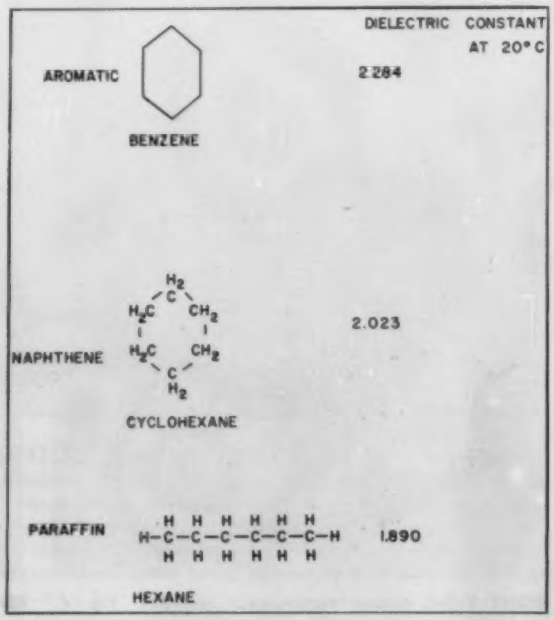
MEASURED CAPACITANCE in this setup is converted to a voltage and enters a bridge circuit. Fig. 3.

can be controlled by a small heat exchanger or water bath.

If the temperature changes in the sample stream do not vary widely, a mechanical device may be used to compensate the pen, or electrical compensation may be added to the measuring circuit.

Octane Improvement Analyzer

An outstanding practical application of capacitance measurement is its use in octane improvement. Humble Oil & Refining Co., by testing the feed and product streams of a catalytic reformer, discovered a relationship between the change in octane number



DIELECTRIC CONSTANT of an aromatic is higher than that of its corresponding naphthene, which in turn is higher than that of the corresponding paraffin. These differences are large enough to be measured. Fig. 4.

TYPICAL RECORD of an octane-improvement analyzer. Fig. 5.

and the change in aromatic content. By measuring the dielectric constants of the streams, the change in aromatic content could be determined.

This discovery prompted Humble to design a system consisting of sample-preparation facilities and a capacitance recorder for dielectric measurement of feed and product streams. At the request of Esso Research & Engineering Co., Foxboro built the first complete packaged system. Its availability and relative low cost make it attractive for future catalytic reformers.

How it works . . . In catalytic reforming the octane number of a low-grade naphtha is improved principally by the conversion of naphthenes to aromatics and the conversion of paraffins to naphthenes and, subsequently, to aromatics. Fortuitously, the dielectric constant of an aromatic is higher than that of its corresponding naphthene, which, in turn, is higher than that of the corresponding paraffin.

An example of this is shown in Fig. 4. The amount of conversion can be determined readily, because the difference in dielectric constants is large enough to be sensed by an available measuring device.

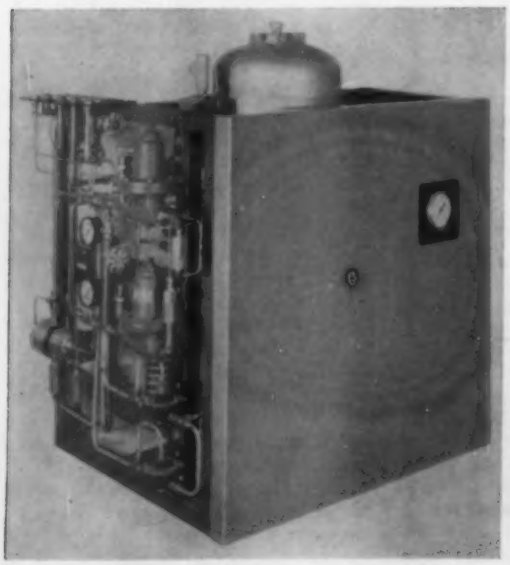
An absolute correlation between dielectric constant and octane number cannot be made, because two naphthas of different cut points and from different crude sources can have widely different octane numbers, although they may have the same dielectric constant. However, the improvement in octane number of a cut of a particular crude can be measured.

Typical record . . . Fig. 5 shows a typical record of an octane-improvement analyzer. As the chart shows, the dielectric constant of the feed to a catalytic reformer is recorded for 7½ minutes, then the recorder switches, automatically, to record the dielectric constant of the product stream. Every 7½ minutes the instrument switches from the feed to the product stream.

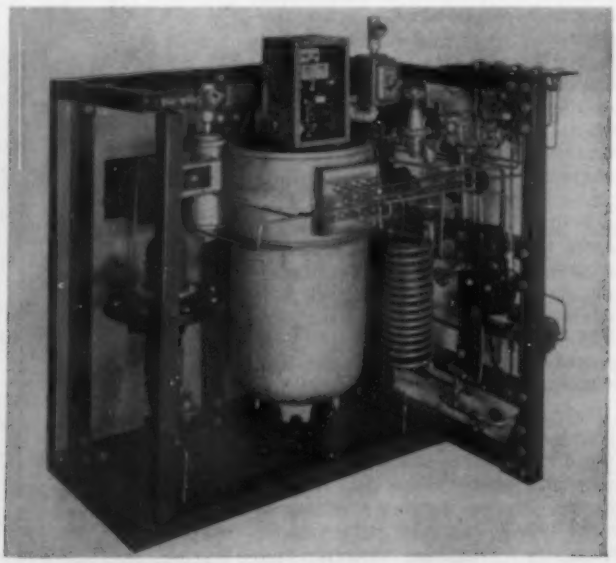
The zero and span are arbitrarily adjusted so that the feed measurement is recorded toward the center of the chart and the product toward the outer edge. The difference between the feed and product values correlates with the increase in octane number. While a recording of the difference only would be sufficient to indicate the improvement in octane number obtained, by recording both the feed reading and the product reading, the feed-stream reading can serve to notify the operator at once of changes in feed stock.

If critical periods of reforming require constant observation of either the feed or product stream, the instrument may be switched to record the capacitance measurement of either one continuously.

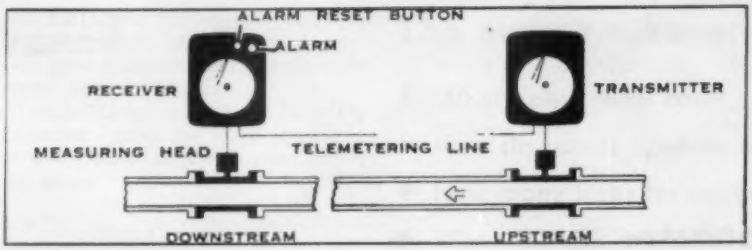
Field-mounted package . . . The sample-preparation system, capacitance cells, and cell-switching relay are contained in a field-mounted package as shown in Figs. 6 and 7. The feed and product samples pass through pressure-reducing valves, safety relief valves, and filters to the water bath



FRONT VIEW, octane-improvement recorder. Fig. 6.



REAR VIEW, octane-improvement recorder. Fig. 7.



CAPACITANCE MEASUREMENT has proved valuable in interface detection in pipelines. Fig. 8.

for temperature conditioning and the capacitance measurement.

Upon leaving the bath, which is in the bottom of the explosionproof housing shown, the samples pass through flow controllers and are sent back to the reformer.

The capacitance cells extend into the feed and product lines, in the top portion of the water bath. In the upper section of the explosionproof housing, the capacitance cells are connected to a cell-switching relay, which is actuated from the recorder, and to a capacitance-compensating unit. The measurement coaxial cable and a three-wire line from the switching relay connect the field unit and the control-panel recorder.

The water-bath temperature is set at the desired value on the front of the field unit. Control at this temperature is achieved by the use of an external steam-water heat exchanger. The control valve and controller shown vary the amount of steam to the exchanger in accordance with the needs of the bath.

As can be seen in Fig. 7, all components used are the rugged type normally used in process operations.

Process value . . . Analyzer has been proved to be of value in processing operations. In one case, for instance, when a recycle gas compressor failed, the operator was able to increase the reactor temperature and reduce the feed rate so quickly that the product pen moved only one division on the recorder chart. Without the analyzer it would have been 4 or 5 hours before he could have determined the effectiveness of his corrective action.

Other Uses

Capacitance measurement has proved valuable in many other instances; for example, in interface detection in pipelines. See Fig. 8. Frequently one element is installed a mile or more upstream of the pumping station or terminal. As the interface passes the element, its dielectric profile is recorded at the pumping station.

By examining this record, the operator decides the proper moment to switch product to another line or pump. Another measuring element at the pumping station traces the same profile, to allow the operator to make the switch at the predetermined point with a minimum of contamination.

An element similar to that for interface detection successfully monitors b. s. and w. in crude oil. Capacitance measurement is especially effective for monitoring b. s. and w. because the dielectric constant of crude oil is approximately 2.2, while that of water is 80.

Also, Humble reports that capacitance measurement successfully determines toluene concentrations in hydroformer distillates, oil content of the wax stream from a solvent-dewaxing plant, the total aromatic content of the charge to sulfur dioxide extraction unit, the propane-oil ratio in a lube-dewaxing process, and the improvement in viscosity index obtained in a lube-oil solvent-extraction unit. Shell Oil Co. monitors acetone purity by measuring its dielectric constant.

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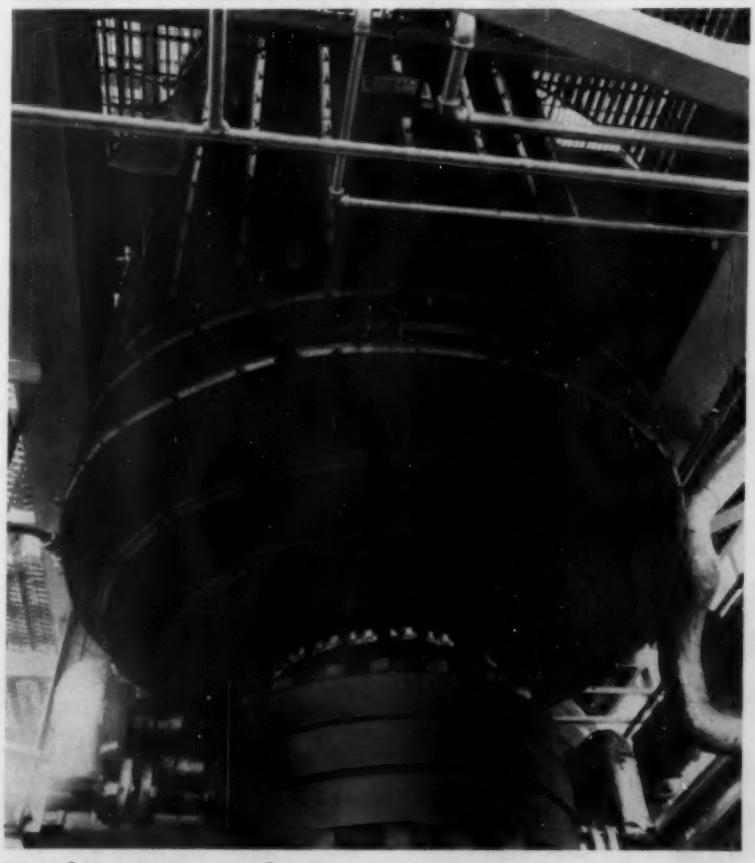

Hydrogen-producing reactor in a petrochemical plant equipped with sensing elements extending around top and bottom and along the sides. The sensing thermistor elements (two-wire system in a ceramic core) operate in conjunction with a transistorized detector unit which monitors the resistance in the sensing elements. A warning circuit is actuated when: (1) temperature exceeds a predetermined level, or (2) temperature changes at a rate in excess of that deemed safe.

- Amine
- Iron sponge
- Hot potassium carbonate:

Three ways to purify gas

There are a number of purification processes available. The most popular for natural gas are the amine, the iron sponge, and, most recently, the hot-potassium carbonate processes. Where does each excel? What are the comparative economics of each process? What are the good and bad points of each?

BY FRED ZAPFFE
Lone Star Gas Co.

1. THE AMINE PLANT

The amine-water (or if dehydration is desired, then the amine-glycol) process has been the standard for many years for larger concentration of hydrogen sulfide or acid gas. Unfortunately, amine will remove all acid gases, i.e. carbon dioxide along with the hydrogen sulfide.

In many cases, to remove even reasonably small quantities of sulfide, large percentages of carbon dioxide must also be removed just to sweeten the gas. This, of course, is a disadvantage from the standpoint of economics of plant installation, operation, and gas shrinkage.

The amine plant can and will do a job of essentially complete removal of hydrogen sulfide. Consistent tests of output gas from an amine plant will show negative to basic lead acetate paper which is accepted as a standard of hydrogen sulfide purity.

Problem of corrosion . . . The amine plant has the disadvantage of corrosion A well-designed plant will have less corrosion than a poorly designed plant; but some degree of corrosion is a part of any amine plant.

How can we minimize this corrosion? By good design naturally, but what is good design? Who establishes the standard? Are you to design the plant to last 3 years or 20 years before it has served the purpose of the project? How do you desire to spend your money, on investment or on higher maintenance? In general, a lower investment precludes a higher maintenance, and vice versa.

Solution loading . . . For example, corrosion can be related to solution loading. You can refer to any one of a number of experimental-data curves to determine the maximum amount of acid gas with which a mole of amine will react in a given-strength solution, at a given temperature.

One such curve will show that at a carbon dioxide partial pressure of 15 psia. a 2.0 normal (12.2%) solution of MEA at 122° F. will react with 0.73 moles of the carbon dioxide per mole of amine. A plant can be built on this basis and will possibly operate, for a while, but before long it begins to come apart at the seams and between the seams.

It is generally agreed that 0.3 moles of acid gas per mole of amine is the maximum that should be attempted, and it is further agreed that the smaller the amount of acid-gas pick-up that can be afforded, the longer the plant will operate with a minimum of difficulty. Further, don't attempt to approach the higher equilibrium figures closer than 65% of theoretical; the viscosity of the foul amine solution becomes quite high at high loadings.

Amine concentration . . . A plant can be designed for an amine solution strength as high as 30%, but 12% is better, and 6% is still better. On that basis, design your pump capacities and related equipment to circulate a solution of low amine concenaration for the immediately anticipated volume and acid-gas content.

Later when the plant throughput volume and the acid-gas concentration increase, as they generally do, you can handle the increased load by increasing the solution amine concentration to not more than 12 to 15%. Your plant will last longer and operate more economically if you don't start with 12 or 15% and then have to increase to 20 or 25%.

Contractor design important . . Where is another large cost item in a MEA plant? The amine. What does it cost? Twenty-five cents per pound. There are plants today that are using, consuming, losing, or in some other wasteful manner disposing of as high as 20 lb. of amine per milllion feet treated. That is unusual but still expensive. Other plants operate at about 1 p.p.m. It can be done. How?

Have a good contactor. Have sufficient number of trays for complete reaction. How many is that?

Author is design engineer, Lone Star Gas Co. Presented at Gas-Conditioning Conference, University of Oklahoma at Norman, Okla.

Maybe double the number you might calculate from theory. Extra trays are good insurance. Extra trays make good heat exchangers.

Make the contactor large enough in diameter. Keep the mass velocity at a low figure. In the Souders-Brown equation:

$$W = C \sqrt{d_2 (d_1 - d_2)}$$

where

W = Mass velocity (max.) of vapor, lb./hr./sq. ft. of tower cross-section area
C = Constant, dependent upon tray spacing and surface tension
D_1 = Density of liquid, lb./cu. ft.
D_2 = Density of vapor, lb./cu. ft. at operating conditions,

use as low a value of C as you can afford—never over 400 for 24-in. tray spacing, lower if possible.

Wire-mesh mist extractor . . . Have a good mist extractor system. New developments are coming along all the time. One of the newer developments is the wire-mesh extractor. A number of concerns make a variety of styles. In general, to remove very fine liquid particles or particulates of less than 10 microns, a stainless-steel wire of 0.006-in. diameter, woven in the form of a small mesh, packed in depths of 8 to 12 in. or even deeper, has given excellent results.

Steel mesh, as described, interwoven with strands of fiber glass has given good retentive characteristics on glycol. If a fine glass strand that will stand the alkalinity of the lean amine has or can be developed, an improved eliminator can thus be made. A lot of work has been done on mist eliminators and filters and more is being done every day.

Watch overhead loss . . . The other point of regular amine loss is out the top of the still. This point takes constant operational supervision. After plant tests have been run to show that the still overhead condensate is running in excess of a few tenths of 1% amine, what can the operator do? If you have designed the still properly, the operator has the choice of increasing the reflux rate to condense and wash more of the amine into the base of the still.

Will your reboiler design handle the extra reflux load? If a chronic problem arises, the operator should be able to transfer the still feed to a lower tray and thus increase the number of trays in the rectifying section.

To repeat: at a time of high amine loss out of the top of the still, it is comforting to be able to reduce the amine concentration in the system solution, which in turn will reduce the amine concentration in the rectifying section of the still, and thus the amine losses out the top of the still. Still diameter is as critical as contactor diameter. Excess vapor velocity can possibly cause excess amine losses.

Leaks . . . The final point of amine loss to be mentioned is very often overlooked by the designer and the troubleshooter, who are trying to locate the high amine losses: just plain everyday leaks. Flange-gasket leaks in the high-temperature sections of the regeneration area can cause vapor leaks that are hard to trace. Pump-packing leaks, while only a drip or a drop, can add up if not properly handled. Atmospheric solution-cooling sections in the cooling tower can leak at the tubing joints. Has anyone checked the cooling-tower water for amine content recently?

To summarize the amine plant . . . It can be made physically small for a smaller investment, but the operational loss of amine and the maintenance cost of corrosion will be proportionately high. The more oversized, within reason, the components of an amine plant can be made, the more economical the operation and maintenance cost will be.

2. THE IRON-SPONGE BOX

The iron-sponge method of purifying natural gas has not received the place of prominence that it deserves in the oil patch.

The author asks—and answers:

- What does amine cost?
- How do plants operate at 1 p.p.m. amine?
- How many trays for complete reaction?
- When the still overhead condensate is running in excess of a few tenths of 1% amine, what can the operator do?
- Will your reboiler design handle the extra reflux load?
- Have you checked the cooling-tower water for amine content lately?
- What is "iron sponge"?
- Should you design for the regeneration of the beds?
- Which process can best be used?

H_2S out, but not CO_2 . . . It has the advantage of being a proved method of removing sulfur compounds without the disadvantage of removing the carbon dioxide. It will remove the undesirable hydrogen sulfide and also, for the gas-transmission people who might overlook this problem, it will remove mercaptans that have been added to the gas for odorization purposes. The iron sponge will make an essentially complete removal of both sulfur compounds to the degree that basic lead acetate will test negative at the outlet of the box.

It has the disadvantage of being a batch process that requires periodic changeout, entailing parallel installations or shutdown periods.

What is "iron sponge"? Basically, iron sponge is wood shaving, available in various sizes and textures of shaving and chips, impregnated with a special hydrated form of iron oxide coating on the wood. The wood shavings serve only to space out the active ingredient, the iron oxide, to control gas distribution and pressure drop. Several grades, as related to the iron oxide content, are available: 6.5 lb., 9.0 lb., 15.0 lb., and 20.0 lb. of active iron oxide per bushel of shavings. The iron sponge is available in 2-bu. sacks. Properly packed in a vessel, a bushel (1¼ cu. ft.) should occupy 1 cu. ft.

A very appropriate price for preliminary estimating is $2 per bushel delivered in Texas or Oklahoma. This price will vary as to grade of sponge and shipping distance.

D. K. Taylor, of Connelly, Inc., which manufactures the sponge, in his paper at a gas-conditioning conference in 1956, set out a few simple

rules for the design of the iron-sponge boxes.

I wish to repeat his rules and add pertinent comments:

1. The oxide bed should be at least 10 ft. deep to produce pressure drop sufficient to give proper distribution over the entire cross-section area of the vessel. This is a good depth. Increased depth, unless supported on trays, or by other means, produces excessive pressure drop, due to compaction. Increased depth is worthy of consideration, however, as shell length is a relatively inexpensive manner of increasing bed life and minimizing the expense of changeover of the charge.

2. The vessel should be of such diameter as to limit sulfur deposition to a maximum of 15 grains per square foot of cross-sectional area of bed per minute. When designing for this rule: remember that sulfur content is usually indicated as so many grains of sulfur or hydrogen sulfide per 100 standard cubic feet.

This rule must consider the number of grains of sulfur that will be present under operating conditions that might be several atmospheres of pressure and thus several times the concentration of the standard test results.

This rule becomes of critical importance when designing for high concentration of sulfur or for high operating pressures. The indicated loading should not be exceeded, and the lower it can be held, the more complete the chemical reaction between the sulfur and the iron oxide. Lower loading will make for closer approach to the theoretical reaction of 0.56 lb. of sulfur per pound of iron oxide present.

3. The time of contact in the bed can most easily be figured by assuming a sponge-bed volume equal to the bed depth, times the cross-section area of the vessel, empty of sponge. Using again the volume of gas under actual operating conditions (preferably minimum operating pressures in case of variable operating pressures), calculate the resident time or the time of contact of the gas in the empty bed volume. Taylor has indicated that this should be 15 to 20 seconds residence time or 240 to 180 actual cubic feet per hour per cubic foot of sponge volume.

This rule needs careful consideration and evaluation. Taylor has qualified his 15 second residence time by the use of a few tenths of 1% of oxygen in the gas stream to reactivate the iron sulfate that is formed.

The economical utilization of oxygen or air injection into the gas stream is subject to debate. If air is not present, we have found that for the maximum utilization of the iron sponge, the residence time should approach 60 seconds rather than 15 or 20 seconds.

"Should we regenerate? . . . My findings say do not consider the regeneration. Your findings may say to do so . . . After the second regeneration, the life may be only 10 to 15 days."

This makes for a larger vessel which minimizes the major expense in the operation of an iron-sponge unit: the changeout operation. Anything that can be done to reduce the number of changeout operations will tend toward economical operation. A closer approach to theoretical reaction is a major step toward economical operation.

4. The life of a batch or a charge must be considered if the size of the bed as indicated by Rule 2 and/or Rule 3 is so small as to require frequent changeouts. As mentioned, the labor of changing out a batch can be a high percentage of the over-all cost of operation. The cost of the sponge itself is not a variable item as related to pounds of sulfur removed.

Under ideal conditions of one-time use of the sponge, 1 lb. of iron oxide will remove 0.56 lb. of sulfur. Under conditions of oxygen regeneration, 1 lb. of iron oxide will possibly remove as high as 2½ lb. of sulfur. If regeneration is not to be considered, then the 15-lb. sponge should be used.

This weight of iron oxide per bushel will give maximum utilization before the void space is filled with sulfur to produce an excessive pressure drop.

If air regeneration is to be used, the 9-lb. sponge will possibly give a better record of purification but might be blanked off by sulfur before it is utilized to the full extent of its potential reaction.

For any given weight of iron oxide per bushel, the amount of sulfide that a given bed will remove can be rather closely calculated, except for blanking off by excessive sulfur or by oil brought into the bed which will seal off the iron oxide and prevent chemical reaction.

So, we are still back to the potentially expensive part of the process, the changeout operation. If the process can be regenerated by a small per cent of oxygen, then a large per cent of oxygen (as when the vessel is opened for servicing) will create a dangerous rise in temperature in the exothermic reaction, and spontaneous combustion can take place. Thus, the bed should be wetted down prior to trying to remove the charge. If water is unavailable or difficult to obtain, then the sponge must be removed with minimum exposure to air and as rapidly as possible.

In any case, several men should be available in such changeout operations to help in case of emergency and to speed the work. The sponge can be difficult to remove. The sulfur will act as a mortar to stick the shavings together. It is brittle as a rule and will crumble, once broken loose.

Ingenuity in vessel design can save considerable replacement labor cost. One method is to twine a chain or cable in the vessel as it is being loaded. Then, to unload, the cable can be pulled out, thus cracking out most of the stuck material. If the vessel is vertical, the spent sponge can be removed from a lower opening and a new charge dumped in through the upper opening.

One 800-psig. vessel 14 ft. high by 3 ft. in diameter was balanced to hand crank about a pivot so that the one opening could be used to let the spent sponge fall out and then be used to fill with new sponge.

My suggestion is to design the shell diameter as large as economically possible to minimize the number of changeouts required and at the same time increase the residence time of the gas in the bed for the most efficient conversion of the iron oxide to sulfide.

Should we regenerate? . . . There are other considerations than the four mentioned; for example, to design for regeneration of the bed or not? My findings say do not consider the regeneration. Your findings may say to do so.

My basis is this: With a new change in place, and a steady rate of sulfur entering the vessel, the sulfur may "break through" or give a position sulfur test at the plant outlet in a period of, say, 60 days. Then, after bringing an air compressor onto the plant site, or running a permanently installed air compressor for a matter of a few hours to regenerate the bed (don't let the bed temperature get above 120°-130° or it might ignite), the bed is then ready for the second run. This time, the bed life may be

only 30 to 40 days. After the second regeneration, the life may be only 10 to 15 days.

We have found that 15-lb. sponge at longer residence time without regeneration, will give better economy of operation than, say, 9-lb. sponge with several regenerations. The labor of regeneration might approximate that of a changeout and the reduced bed life following regeneration makes the regeneration method a questionable economic venture. Our plants were at the wellhead, a good distance from headquarters. Your purification plant might be in a plant yard where an air supply and ready labor is available. It is always an individual design problem.

To summarize the iron-sponge process: It has the advantage of removing only sulfur compounds. It requires a relatively small investment as compared to other processes. It is a batch process that means alternate equipment or bypass or shutdown, for the changing of the sponge charges. It can be economical from the operational standpoint. It is a good, safe, practical method, in spite of what appears to be hazardous problems.

Many such units have been used with no serious problems. Much of the hazard exists in the mind of the operator if he has been improperly advised of the dangers involved. After a few changeouts, his attitude changes, and he feels that it is no more hazardous than any other phase of the natural-gas business.

3. THE HOT-POTASH METHOD

The third process to be considered is the hot-potassium carbonate method. This has been just recently introduced to the natural-gas industry for the removal of large quantities of acid gas. It is used in conjunction with an amine plant as followup, which completely removes the traces left by the carbonate method.

The indications are that the economics of both a carbonate plant and a followup amine plant are better than a single amine plant of sufficient circulation capacity to remove the full volume of acid gas.

Comparative Evaluation

We have now considered three purification processes. Which process can best be used where? Each has certain areas that are practically reserved for that particular process. On marginal or overlapping areas, the only practical way is to design for the two processes involved and decide on the economics as applied to that particular project.

1. To generalize: Starting with the low end, i.e., low pressures, small volumes of gas, and small concentrations of sulfur, the iron sponge cannot be approached by the amine in economy or even purity of product. At some operating pressure below 100 psig., the amine process will fail to produce completely sweet gas.

The investment value of the amine-regeneration equipment cannot be justified for removal of only a few grains of sulfur from a few million feet per day of gas. The iron sponge is also quite economical at high pressures. It is only when the sulfur loading becomes too high that the economics swing from the sponge box to the amine plant.

2. At the upper end of the range, the hot-potash method seems to take over. At values of 24, 16, or even 8% of sulfur or acid gas, the hot-potassium carbonate method should by all means be investigated.

3. Then there is the middle ground of the acid-gas concentration, gas volume, and operating-pressure complex, wherein the amine plant is just about the only practical choice to make.

The overlap . . . It is the overlapping field between the amine plant and the iron sponge on the low side of the middle and then between the single amine plant and the combination of the amine and hot-potash plant on the high side of the middle that cannot be generalized upon. The economics of each project depends upon the viewpoint of the developer, the background and future of the project, and other factors that only a detailed engineering evaluation can determine.

The design engineer, to make an intelligent selection of gas purification equipment, should have a complete theoretical process-design background on all phases of the problem, extensive theoretical and practical background on the practical operational aspects of the plants, and a comptroller's understanding of the value of company money so that the tabulated relative merits can be laid out for systematic evaluation. From that tabulation, the man who makes the decision can select any process or size plant that he desires.

"The value of company money . . ."

Some Background

The Gas Conditioning Conference at University of Oklahoma has had some excellent papers on the subject of gas treating in past years.

At the 1957 meeting there were two papers by Ivan Peterson and J. S. Connors. Each, in its own degree of detail, generalized on the treating methods and gave details on basic design of amine plants. H. G. Muhlbauer gave a paper on equilibrium data for amine solutions.

In 1956, L. D. Polderman discussed degradation of diethanolamine in gas-treating service and D. K. Taylor gave specific design data on the iron-sponge method of sulfide removal.

In 1955 J. W. Cronenberg gave some interesting operational problems with glycol-amine plants and L. D. Polderman discussed degradation problems of monoethanolamine.

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Israel May Enlarge Pipeline

ISRAEL may replace part of its 250-mile pipeline system from the Gulf of Aqaba to Haifa refinery with larger pipe.

The present 8-in. section from Elat to Beersheba limits throughput to 23,000 bbl. daily. By replacing the section with 16-in. pipe, the size of the rest of the system, capacity would be raised to match the needs of the 85,000-bbl. refinery if it were placed on full produtcion.

The country's ministry of finance is studying the possibility of buying the Haifa plant from British Petroleum Co. and Royal Dutch-Shell.

The expansion project is separate from an Israeli proposal for a big-inch line to the Mediterranean, which would serve as a substitute for oil shipments through the Suez Canal. The 190-mile, 32-in. line would carry up to 500,000 bbl. daily.

Israel reportedly is reviving the proposal, first made during the 1956 Middle East crisis. French interests were ready to finance the program last year but failed to get United States support.

The day of bidding "by the seat of the pants" is gone—laid to rest by rising costs and stronger competition. The accent now is on more and better . . .

Cost controls for the drilling contractor

Here is a case study of how one contractor has faced up to the currently grim realities of competitive existence. This company's approach is only one of many, and no claim to perfection is made. In many ways it is probable that the approach discussed is typical of that pursued by many other contractors, simply as a matter of necessity.

BY WALTER H. HELMERICH III
Helmerich & Payne, Inc., Tulsa

STATISTICS show that in the 16 years since 1941, average rotary-drilling costs have more than doubled, while drilling prices have gone down 10%.

The contractor has three ways of meeting this problem:

- He can do a more efficient job of drilling—and he has. Since 1941, average drilling time in comparable fields has dropped 46%. However, this has not been enough to restore the parity between costs and prices which existed 16 years ago; in fact, it is still about 20% on the short side.
- The contractor can work on boosting his prices; but these are set by competition which is now, as you know, at a fever pitch.
- He can concentrate on the cost side of his books, to know and control the ways money gets spent.

In an example case, the first problem met in attempting to create good cost controls was the shortage of recorded experience. Controls depend upon comparisons; knowledge of cost at any one time is valueless unless compared to previous costs. These were not available in sufficient detail, and it was necessary to begin to accumulate them.

In determining which costs it was desirable to accumulate, the bid sheet was considered first, because a primary concern of costing must be to establish standards for obtaining revenue, i.e., bidding. Bid mistakes cannot be overcome by operational efficiency. If bids are incorrect, the whole organization suffers the consequence. So the beginning was with the bid—to design a bid form which could use the best cost data available.

Contract Footage Bid

The contract footage bid is the first of a group of forms (Fig. 1) which were completed in connection with an actual well drilled last year. In the past, for too many years, the contractor bid "by the seat of his pants." He knew roughly what he thought his costs were each day, and he knew from the other wells drilled in the area about how many days it might take. He would multiply these and come up with a price.

Today in our company we use this bid sheet. As a matter of firm policy, it must be filled out completely before one of our rigs is put to work. Two basic purposes lie behind this rigid requirement. First, computing total cost by building up the sum of component smaller costs will always lead to greater accuracy than a single estimate of the total itself. Second, and even more fundamental, someone now is held accountable for estimates that are made before the job starts.

The contract footage bid is broken into two major parts: (1) direct out-of-pocket costs, and (2) recovery-of-equipment costs. The first part, in turn, is composed of rig-operating costs which can be expected every day on any well being drilled, of variable costs which can be expected because of the characteristics of this particular well, and of fixed out-of-pocket costs which are being incurred every day regardless of whether the rig is drilling or is stacked.

Within the first cost area, direct out-of-pocket costs, lie two types of costs. There are those that are fairly constant and can be estimated on a daily basis (e.g., labor and supervision). Others, however, are irregular in occurrence and, to be recovered, a factor must be used to spread the recovery in a regular or constant fashion over each day of drilling. Maintenance is a good example of this. A rig may be overhauled perhaps only once every 2 or 3 years, yet the daily maintenance-cost factor must absorb that one big overhaul. To do this, a cost history of maintenance is built up and reduced to a daily cost factor. That, then, is a real out-of-pocket cost to us spread over the period of its occurrence. Again, overhead is a real cost. Each quarter we take our actual overhead cost of salaries, transportation, rent, expense accounts, and all the others, and then allocate the total on a per day basis for the coming 90 days.

A further refinement then becomes necessary in determining the final allocations for these spread cost factors.

This paper was presented at the spring meeting, Division of Production, API, April 1958, under the original title, "Cost Control for the Drilling Contractor."

Contract Footage Bid

Date 12-19-56
Depth 12,200'

OPERATOR Sinclair Oil & Gas — WELL Harris No. 1
ADDRESS — ATTENTION OF
STATE New Mexico — COUNTY Lea — LOCATION Section 18-12S-36E 1980 FNL 660 FEL
BID WITH RIG — LOCATION East Lovington
RIG UP 3 — YEAR DOWN 2 — DRLG. #3 — OTHER — TOTAL DAYS 68
REMARKS

	Total	Av Per Day Days	Av Per Ft Ft	
DIRECT OUT-OF-POCKET COSTS				
RIG OPERATING COSTS				
Labor & Supervision	23,800.00	350.00		
Supplies	4,788.00	41.00		
Maintenance	11,628.00	171.00		
Sub-Total	38,216.00	562.00		
VARIABLE COSTS				
Bits	23,625.00	347.43		Footage Bid 8.65
Transportation	5,500.00	80.88		
Location Dr	3,000.00	44.11	5%	8.66
Fuel & Lines	3,060.00	45.00	10%	
Water & Lines	700.00	10.29		
Fishing etc. Dr			15%	
Other				
	4,400.00	64.70		
Sub-Total	40,285.00	592.41		
FIXED OUT-OF-POCKET COSTS				W/DP MD/DP
Home Office Overhead			0 - 10,000	950 900
Field Office Overhead			10 - 11,000	1000 950
Interest & Insurance			11 - 12,200	1050 1000
Sub-Total	6,800.00	100.00	Standby $750.00	
TOT DIR OUT-OF-POCKET COSTS	85,301.00	1,254.41		
RECOVERY-OF-EQUIP COSTS				
Rig Depreciation	10,200.00	150.00		
D P Depr. Dr	5,166.00	76.00		
TOT RECOVERY-OF-EQUIP COSTS	15,366.00	226.00		
GRAND TOTAL COSTS	100,669.00	1,480.41	8.25	
PROFIT				
EARNINGS				

Casing	Depth	No. Bits	Size	Price	Total
13-3/8	350	1	17-1/4	200	200
9-5/8	5000	10	12-1/4	300	3000
7	12200	70	8-3/4	200	14000
		9	8-3/4	1133	5670
			8-3/4	1133	2832
		Bnd. 5	8-3/4	150	750
		Total			26452

Transportation

Move, Skid: 30/40 Miles	4,000
Rig Up	900
Tear Down	600
Incidental	
Total	5,500

FORMS like this tell the contractor where he stands when he submits his bid. Fig. 1.

OPERATOR Sinclair Oil & Gas Co. — WELL Harris #1
STATE New Mexico — COUNTY Lea — LOCATION Section 18-12S-36E
RIG NO. 44 TOOL PUSHER Ray Marsh — RIG UP 12-27-56 — YEAR DOWN 3-12-57

	TOTAL	AV. PER DAY 9.5 DAYS
DIRECT OUT-OF-POCKET COSTS		
Rig Operating Costs		
Labor & Supervision	3,334.50	351.00
Supplies	397.50	41.85
Maintenance	1,615.00	170.00
Sub-Total: Rig Operating Costs	5,339.00	562.00
Variable Costs		
Bits		
Transportation	393.80	41.66
Location Derrick		
Fuel & Lines	1,093.61	115.10
Water & Lines		
Fishing, etc. Days		
Other Some, Inc.	36.58	3.85
Sub-Total: Variable Costs	1,525.79	160.61
Fixed Out-of-Pocket Costs		
Home Office Overhead		
Field Office Overhead		
Interest & Insurance		
Sub-Total: Fixed Out-of-Pocket Costs	1,187.50	125.00
TOTAL DIRECT OUT-OF-POCKET COSTS	8,052.29	847.61
RECOVERY-OF-EQUIPMENT COSTS		
Rig Depreciation	1,330.00	140.00
Drill Pipe Depreciation 4.1 Days 75.39	309.10	32.54
TOTAL RECOVERY-OF-EQUIPMENT COSTS	1,639.10	172.54
GRAND TOTAL COSTS	9,691.39	1,020.15
PROFIT	(156.51)	(16.48)
EARNINGS	9,534.88	1,003.67

Casing	Depth		W/DP	MD/DP
		0 - 10,000	950.00	900.00
		10 - 11,000	1,000.00	950.00
		11 - 12,000	1,050.00	1,000.00

THE CONTRACTOR must show a profit on day-work operations as well as footage work to come out ahead on a well. Fig. 3.

OPERATOR Sinclair Oil & Gas Co. — WELL Harris #1
STATE New Mexico — COUNTY Lea — LOCATION Section 18-12S-36E
RIG NO. 44 TOOL PUSHER Ray Marsh — RIG UP 12-27-56 — YEAR DOWN 3-12-57

	TOTAL	AV. PER DAY 46.5 DAYS	AV. PER FT. 11968 FT.
DIRECT OUT-OF-POCKET COSTS			
Rig Operating Costs			
Labor & Supervision	24,238.71	373.02	2.08
Supplies	1,564.59	43.65	.25
Maintenance	11,305.00	170.00	.95
Sub-Total: Rig Operating Costs	39,292.30	590.66	3.28
Variable Costs			
Bits	20,716.44	311.53	1.73
Transportation	6,597.00	99.20	.55
Location 541.50 Derrick 2002.26	2,543.76	38.25	.21
Fuel & Lines	7,835.02	117.82	.65
Water & Lines	595.66	8.96	.05
Fishing, etc. Days			
Other Gas, Grease	1,246.85	18.75	.10
Misc. & Spec. Eqs.	403.26	6.06	.04
Sub-Total: Variable Costs	39,938.17	600.57	3.33
Fixed Out-of-Pocket Costs			
Home Office Overhead			
Field Office Overhead			
Interest & Insurance			
Sub-Total: Fixed Out-of-Pocket Costs	8,312.50	125.00	.69
TOTAL DIRECT OUT-OF-POCKET COSTS	87,543.97	1,316.43	7.30
RECOVERY-OF-EQUIPMENT COSTS			
Rig Depreciation	9,310.00	140.00	.78
Drill Pipe Depreciation 53 Days 75.39	1,920.28	28.95	.33
TOTAL RECOVERY-OF-EQUIPMENT COSTS	11,230.28	168.95	1.11
GRAND TOTAL COSTS	100,773.25	1,515.38	8.41
PROFIT	2,922.95	43.96	.24
EARNINGS	103,696.20	1,559.36	8.65

11,980' @ 8.65 per foot.

Casing	Depth	No. Bits	Size	Price	Total
13 3/8	300	1	17½	Rating	67.50
9 5/8	4478	6	12¼		2,417.07
7	T.D.	51	8 3/4		13,100.15
		3	8 3/4 C-3		1,279.09
T.D.	11980	Bnd. 15	8 3/4 Chart		3,132.62
		Total			20,716.44

Transportation

Move, Skid: 40 Miles	4,524.16
Rig Up	652.00
Tear Down	45.00
Incidental	1,385.82
Total	6,597.00

THE BID SHEET is broken down into two parts: direct out-of-pocket costs and depreciation on equipment. Maintenance and overhead are included, of course, and prorated on a daily basis. Fig. 2.

Tool Pusher Ray Marsh — Rig 44 Well Harris #1
Location Lea Co., New Mexico — Operator Sinclair Oil & Gas Co.
Operating Days 76 — Date 12-27-56 to 3-12-57

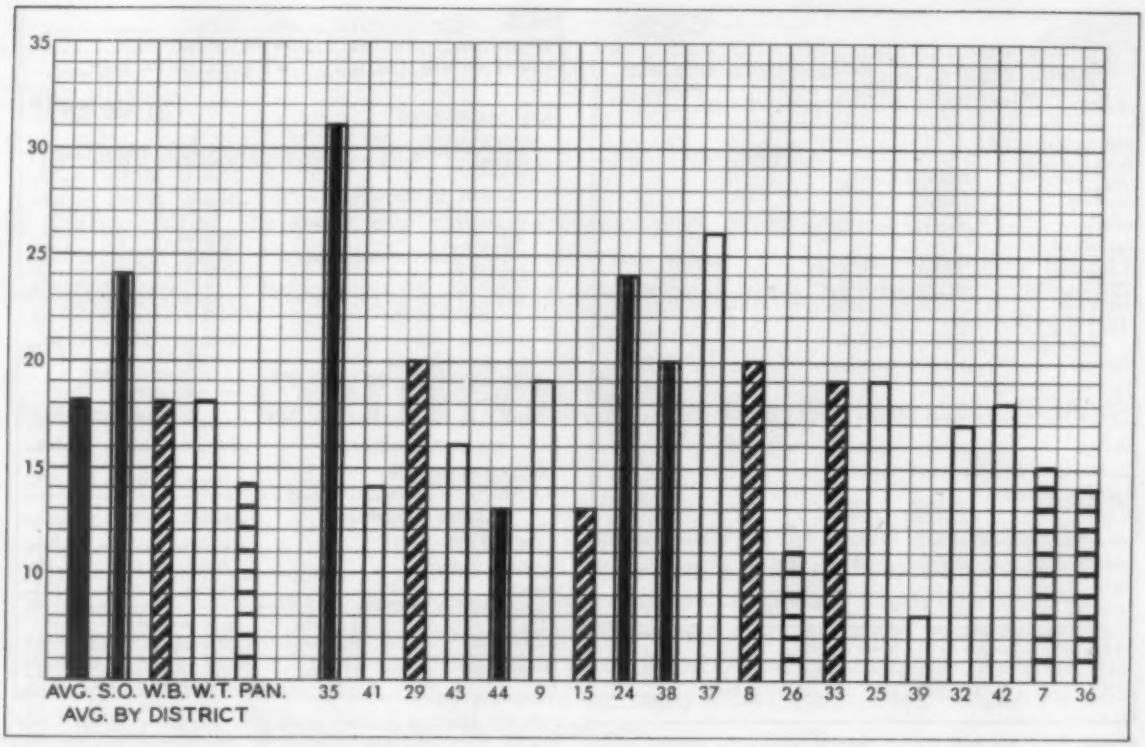
Acc't.	Item	Total Cost Per Period		Average Cost Per Day (Period)		Remarks
111	Labor; W.O.I., Move	555.15		7.30		
112	Labor, Rig Up	1,254.90		16.51		
113	Labor, Drilling	24,695.24		324.93		
114	Labor, Tear Down	222.44		2.93		
12	Supervision	3,534.77		46.50		
	Sub Total-Labor		28,273.21		372.03	
21	Rig Supplies	929.58		12.23		
22	Hand Tools	258.43		3.40		
23	Valves & Fittings	91.87		1.21		
24	Oil & Grease	2,160.21		28.42		
	Sub Total-Supplies		3,438.09		45.24	
311	Drawworks	169.73		2.24		
1. 312	Compound & Chain	920.13		12.67		
321	Mud Pump, Fluid End	778.81		10.25		
322	Mud Pump, Power End	20.47		.69		
323	Mud System	380.91		5.01		
324	Other Pumps	85.38		1.07		
2. 331	Drilling Engines	3,784.30		49.72		
334	Other Engines	461.28		6.09		
34	Overhead String	384.81		4.54		
343	Wire Line					
3. 35	Other Equipment	1,546.11		20.35		
363	Maintenance Trucking					
364	Welding	222.80		2.70		
38	Drill Pipe	1,294.00		17.00		
4. 391	Drill Collars	1,218.78		15.98		
392	Subs	28.58		.39		
	Sub Total-Maintenance		10,126.15		133.28	
	Total Rig Operating Costs		41,837.45		550.49	
41	Bits & Reamers	20,716.44				
421	Trucking In	4,524.16				
422	Other Transportation	1,253.60				
423	Rig Up	652.00				
424	Tear Down	45.00				
51	Location	2,543.76				
52	Fuel & Lines	8,278.43				
53	Water & Lines	595.66				
	Gas, Grease	1,246.85				
	Fal & Power Hole	1,169.00				
	Misc.	409.82				
	Total-Variable Costs		41,443.96		544.58	
	GRAND TOTAL		83,281.41		1,095.07	

1. Compound Chain - Rectuple 779.43
2. Rework 4-Heads & Valve Jobs 3,032.84
3. Convert ASE Air Comp. to 556 605.84
4. Hardband 10-7" D.C. 900.00
Stab 3-6-1/2 D.C. 372.20

A COMPLETE STUDY of direct rig costs is possible by using IBM accounts for each part. These data help in the redesign of rigs as well as in current cost studies. Fig. 4.

Since we cannot expect to operate our rigs continuously, we must build in an expected-activity rate. The working rig days must generate sufficient cost coverage to absorb the idle rig days. For example, if activity is predicted at 75% for the coming quarter, then each spread factor such as maintenance must be increased one-third to support the 25% down time.

In the area of recovery-of-equipment costs, the same adjustment for



THIS TYPE OF CHART permits cost comparisons from rig to rig and from district to district. The information is thoroughly studied at the monthly tool pushers' meeting. Fig. 5.

activity is also required. Thus depreciation incurred on a rig while it is stacked can be absorbed while it is active.

A further comment on the spread factors—rather than carrying it to the point of using each rig's individual history to construct its own factor we group rigs by classes in terms of their capacities, and then use the same factor for each rig in the same class.

By the time the contract footage bid has been completed we have a good idea of the cost of doing the job. We have an actual worksheet to which we can refer and for which someone is held accountable.

Contract Footage and Day-Work Cost

Now the well has been drilled in accordance with the bid, the costs have been incurred, and, win or lose, it is just history. But, of course, the cost recording has just begun in order to provide better standards for the bids we are preparing today and to assist in equipment design and maintenance.

The costs are accumulated and recorded in just the same way that they were estimated on the bid sheet. Fig. 2, contract footage cost, parallels the contract footage bid in all respects. Now we know how sound our advance estimates were, in some detail.

Fig. 3 shows the day-work cost tally, which again parallels the contract footage bid in order to provide a comparison. The fact that we accumulate our costs under both footage and day-work conditions points up a continuing problem in the drilling industry. For too many years the drilling contractor failed to know that he was earning money under two different principles with different costs for each. We earn money on a footage basis by risking the completion of a hole in estimated time, and we earn money by renting our equipment.

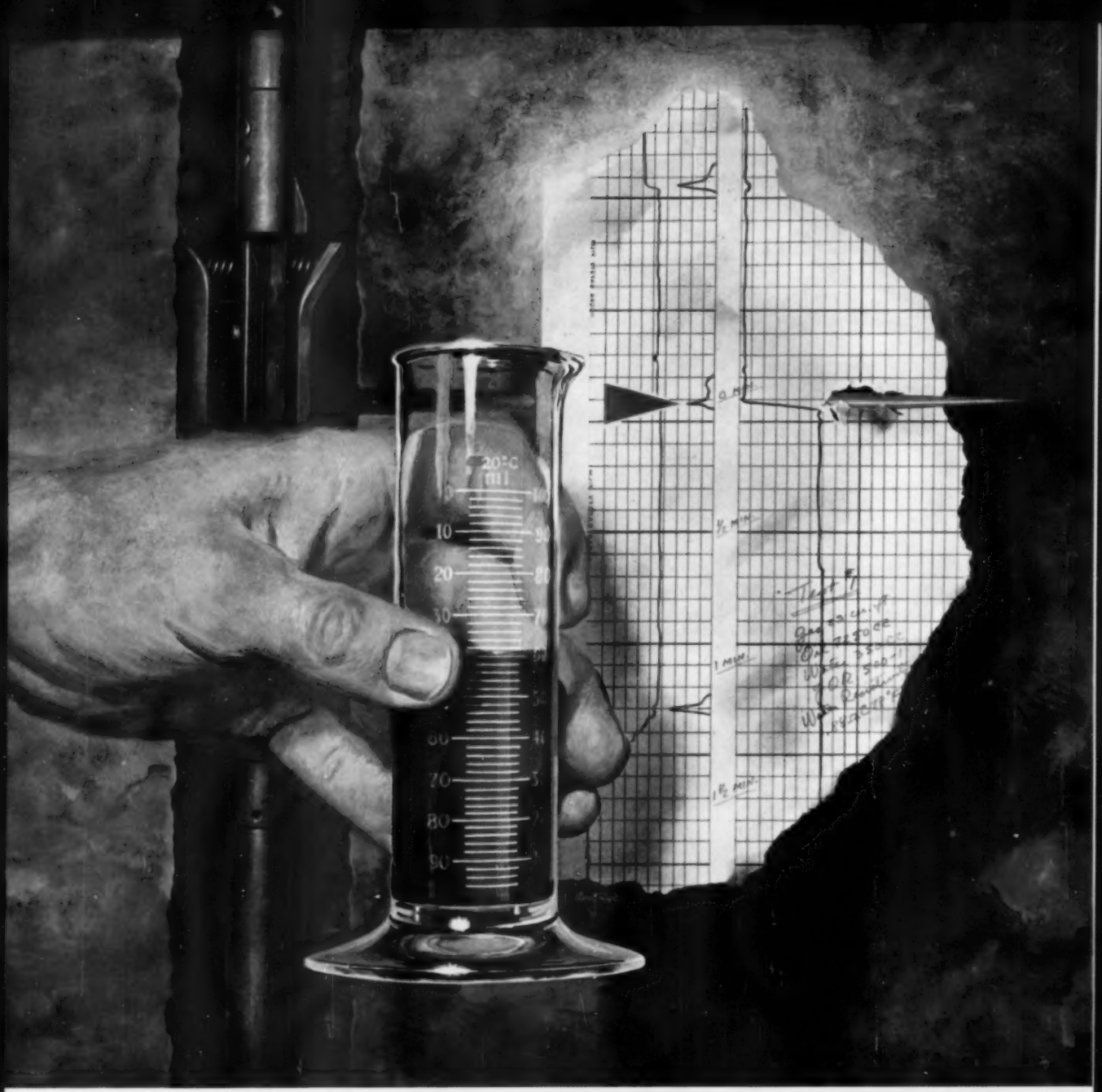
For too long our costs have been unallocated to these two means of earning money; they were lumped together. So many times you have heard the contractor say, "That's awfully cheap footage but your day rates are pretty good and maybe we can come out on it," or "Your day rates are lousy and we'll lose money but maybe we can come out on the footage." Well, it doesn't make sense not to know what your costs are under each of these two means of earning, and we must earn a profit under either method.

Direct rig cost . . . Fig. 4 is a breakdown of our IBM accounts, showing in detail how completely our drilling costs are kept. There are two good reasons for this detailed breakdown. One is in our ability to actually trace why one rig may cost more than others to run. Here we can get into pump costs, draw-works costs, labor, or any other items that may be the cause of that problem.

The second, a more long-range use of this detailed information, is in the purchasing of new equipment and in the rigging up of equipment. We've discovered some inefficiencies in our present drilling equipment but changes would save so little that modification or replacement would not pay out. On the other hand, when that equipment is replaced, the saving of $2 or $3 a day may be passed on in the future because of information and data we've collected in the past.

Rig cost graphs . . . The cost data on these graphs are useful to us only if they are understood and if lead to corrective, positive action. We knew they had to be understood and used by our men in the field. That was really one of the toughest problems we faced. We weren't spending the money in Tulsa. We weren't running the rigs in Tulsa. Our men in the field were doing both. How could this information best be given to them in useful form?

Fig. 5 is just one page from a book



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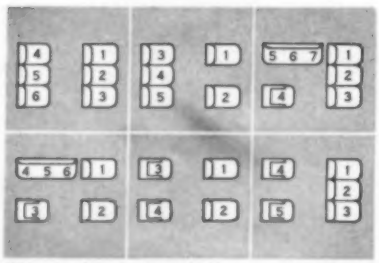

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Beechcraft

BEECHCRAFTS ARE THE AIR FLEET OF AMERICAN BUSINESS

OPERATOR Sinclair Oil & Gas Co. WELL NAME Harris #1

STATE New Mexico COUNTY Lea LOCATION Section 18-12S-38E

RIG NO. 44 TOOL PUSHER Ray Marsh RIG UP 12-27-56 TEAR DOWN 3-12-57

	Contract	Daywork	Total
EARNINGS	103,696.70	9,534.88	113,231.08
COST	100,773.25	9,691.39	110,464.64
PROFIT	2,923.45	(156.51)	2,766.44
% PROFIT	2.9%	(1.6%)	2.5%
OPERATING DAYS	66.5	9.5	76
AVERAGE EARNINGS PER DAY	1,559.34	1,003.67	1,489.88
AVERAGE COST PER DAY	1,515.38	1,020.15	1,453.48
AVERAGE PROFIT PER DAY	43.96	(16.48)	36.40

TOTAL DEPTH 11988

Actual Maintenance $10,126.35
Maintenance Factor 12,920.00
Overabsorbed Maintenance $ 2,793.65

WAS MONEY MADE on the well? In this case, the answer is "Yes." Notice that the actual maintenance was less than the maintenance factor, and the "overabsorbed maintenance" is carried over for a rainy day. Fig. 6.

RIG NO. 44

DRILLING FOREMEN: WELL NAME Henry A. Harris #1

LOCATION 1980' from the North line and 660' from the East line of Section 18, T-12-S, R-38-E, Lea County, N. M.

OPERATOR Sinclair Oil & Gas Company
Mr. C. C. Salter, Dist. Prod. Supt., Hobbs, N. M.
Phone ED 3-4150 or ED 3-4159

CASING AND HOLE PROGRAM
13-3/8" casing cemented at approximately 350'
9-5/8" casing cemented at approximately 5000'
7" casing cemented at approximately 12,000' or on top or through the Devonian.

FORMATIONS EXPECTED

DEPTH	DESCRIPTION
0 - 250	Sand and Caliche
250 - 2000	Red Beds
2000 - 2115	Anhydrite
2115 - 3450	Salt and Anhydrite
3450 - 5000	Anhydrite, Dolomite and Lime
5000 - 6000	Dolomite, Anhydrite and Shale
6000 - 9700	Shale and Lime
9700 - 10500	Lime and Shale
10500 - 10800	Shale and Lime
10800 - 11900	Lime, Sand and Chert
11900 - T.D.	Dolomite and Lime

DEVIATION: The contract deviation is as follows: 2° from surface to 1000'; 3° from 1000-3000'; 4° from 3000-4500'; and 5° from 4500 - T.D. The deviation is not a critical factor in drilling this well, and the deviation should be under three degrees most all the well. It is recommended, therefore, that a stabilizer be run only when deviation rises above 2° which is expected at approximately 8000'. Constant weight on the bit when using a stabilizer will give the maximum benefit from stabilization. The stabilizer should be used at 60' except with a reamer, then it should be placed at 30' above the reamer.

BITS: Use jet bits with 5/8" jets to 5000' with a circulation rate of 800 GPM. When using 8" liners, 800 GPM can be maintained with 50 SPM and when using 7" liners, 800 GPM can be obtained with 60 SPM.

From 5000-9500' jet bits can be used to get maximum hole from our bits. Jet bits with 9/16" jets should be used with a circulation rate of 490 GPM. Below 9500' conventional bits should be used with a circulation rate of 350-400 GPM.

From the bits used in this area, chert bits can possibly be used to good advantage from 11350-11800. Three chert bits should be sufficient to drill this section.

HOLE CONDITIONS: From studying the wells drilled in the area, there seems to be no serious hole problems except crooked hole and this is not of a serious nature.

MUD: Salt saturated water will be used in drilling the intermediate hole. If possible, use the reserve pit as a settling tank. Clear water will be used below the intermediate casing to approximately 5000'. A gel-chemical mud will be used below 9500' to T.D.

REPORTS: Please show that all measurements of casing records, formations encountered, daily drilling reports and log of the well, including depth used in the payment of footage bill, are taken from surface or ground level:
Also make sure that the distance from the Kelly Drive Bushing to Ground Level is recorded on the tour sheets.

OPTIMUM DRILLING PROCEDURE is essential to successful drilling operations. This is carefully summarized and each detail is carefully gone over with the tool pusher and drillers. Fig. 8.

Operator Sinclair Oil & Gas Well Harris #1

TOTAL VARIANCE

Bid Profit	3,841
Actual Profit	2,923
Favorable (Unfavorable) Profit Variance	(918)

CAUSES OF VARIANCE

DRILLING TIME
Bid Days 68 Actual Days 66.5
Actual Days (Over) Under Bid Days 1.5

Costs Per Day

Rig Operating Costs - Bid	562.00	
Fixed Out-of-Pocket - Bid	125.00	
Recovery of Equipment Costs - Bid	216.00	
1.5 Days (Over) Under x Costs Per Day	903.00	1,355

RIG OPERATING COSTS
Bid Costs Per Day 562 Actual Costs Per Day 590.86
Favorable (Unfavorable) Variance Per Day (28.86)

(28.86) Favorable (Unfavorable) Variance x Actual Days 66.5 (1,919)

VARIABLE COSTS

	Bid	Actual	Favorable (Unfavorable) Variance	
Bits	23,625.00	20,716.64	2,908.36	
Transportation	5,500.00	6,597.00	(1,097.00)	
Location	2,000.00	2,243.76	436.24	
Fuel & Lines	7,060.00	7,835.02	(4,775.09)	
Water & Lines	700.00	595.66	104.34	
Fishing				
Other	4,400.00	1,650.09	2,749.91	
Total	43,285.00	39,938.17	346.83	347

DRILL PIPE DEPRECIATION
Actual Days 68 Days with Drill Pipe 53.0
Bid Cost Per Day (Factor Basis) 75.39

15 Days (Over) Under x Cost Per Day 75.39 1,133

DEPTH OF WELL
Bid Depth 12,200 Actual Depth 11,988
Actual Depth Over (Under) Bid Depth 212

212 Depth Over (Under) Bid x Price Per Foot 8.65 (1,834)

Favorable (Unfavorable) Profit Variance (918)

A COMPARISON between the estimate and the actual performance helps tell what happened on the well. Here the profit was $918 less than anticipated. Fig. 7.

WELL NAME Henry A. Harris No. 1 OWNER Sinclair Oil & Gas Company

STATE New Mexico COUNTY Lea LOCATION Section 18-12S-38E DEPTH 11,988'

RIG NO. 44 TOOL PUSHER Ray Marsh RIG UP 12-27-56 TEAR DOWN 3-12-57

	Footage Hours	Footage %	Daywork Hours	Daywork %	Total Hours	Total %
Rig Up	80	4.7			80	4.4
Tear Down	80	4.8			80	4.4
Drilling Bit on Bottom:	936-1/2	59.2			936-1/2	51.8
Footage						
Daywork						
Trips	283-3/4	17.8			283-3/4	15.7
Run Csg. - Including Cond. Hold	37	2.3			37	2.0
WOC	140	8.8			140	7.7
Straight Hole Test	19-3/4	1.1			19-3/4	1.0
Mix Mud	8-3/4	.5			8-3/4	.5
Lost Circulation						
Rig Repairs	9-3/4	.6			9-3/4	.5
Rig Service	14	.9			14	.9
Reaming:	8-1/2	.5			8-1/2	.5
Footage						
Daywork						
Fishing - Including Trips						
Stuck Pipe	1-1/4	.1			1-1/4	.1
Daywork - Other			228-3/4	100.	228-3/4	12.7
Footage Delay Time						
TOTAL	1579-1/4	100.	228-3/4	100.	1808	100

Drlg. W/10,000 Lbs. or Less on Bit

Coring Footage

	Hours	Hours
Total Time	228-3/4	
Less: Daywork		
Fishing		
Stuck Pipe	1-1/4	
L. C.		
Repairs	9-3/4	
Other		
	237-3/4	
	228-3/4	

	Weight On Bit	Degrees Off	No. B. C.
1,000'	46,000	1-1/4	15
2,000'	46,000	3/4	15
3,000'	46,000	1-1/2	15
4,000'	50,000	1-1/2	15
5,000'	50,000	3/4	25
6,000'	50,000	3/4	25
7,000'	50,000		25
8,000'	50,000	1-3/4	25
9,000'	50,000		25
10,000'	50,000	1-3/4	25
11,000'	50,000	1-3/4	25
12,000'			
13,000'			
14,000'			

CASING PROGRAM:
13-3/8" Spiral Weld Csg. @ 350' w/420 sxs.
9-5/8" @ 4496' w/2600 sxs.

BIT SUMMARY: 7" @ TD
6 - 12-1/4
44 - 8-3/4

SPUDDED: 12-31-56
RIG RELEASED: 3-11-57

Max. Degrees off: 1-3/4 @ 11,755'

DAYS W/BP PTG. 53
IN 4.1

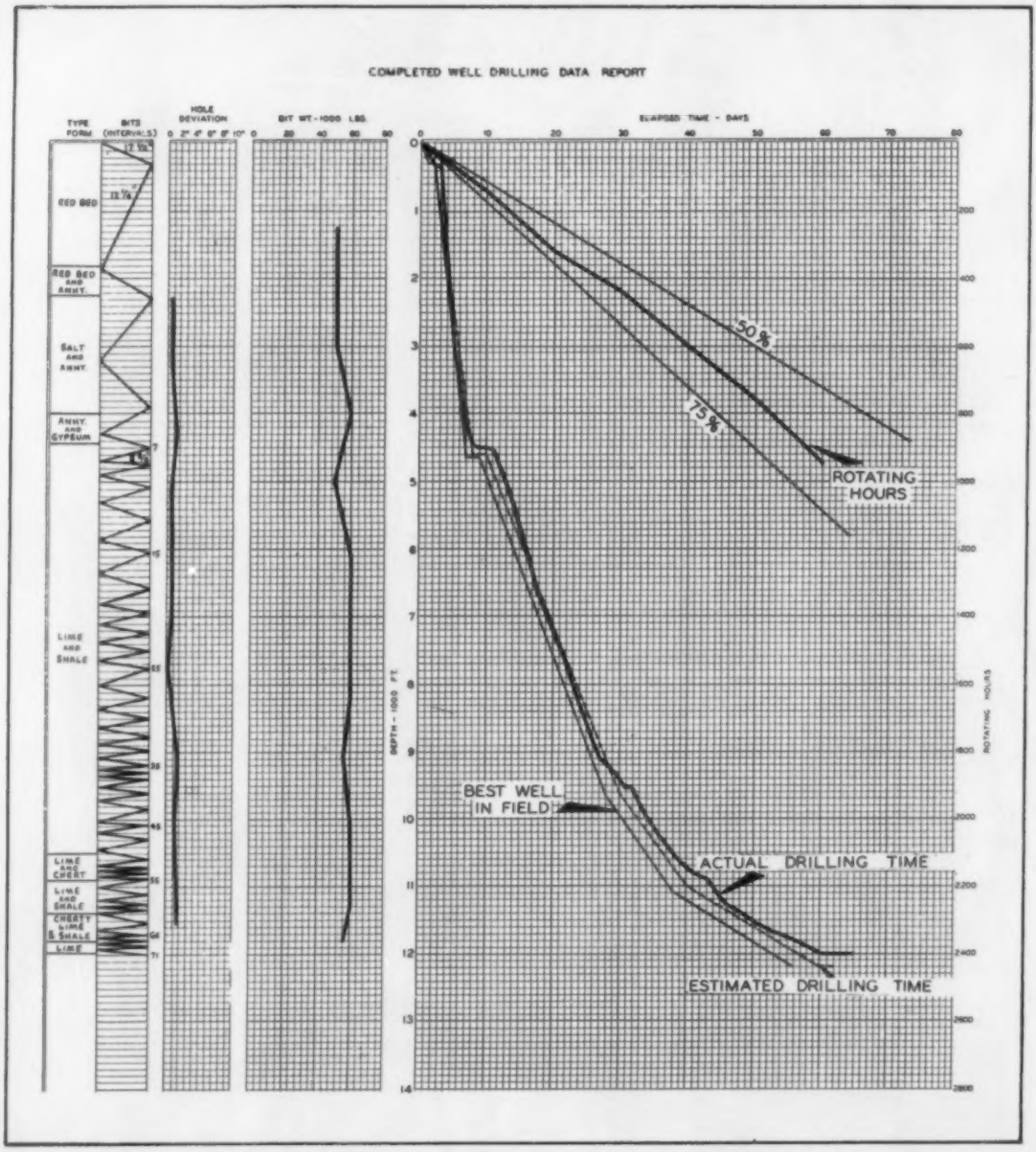
A POST MORTEM helps set the pattern for future bidding and for equipment design. This is simply an analysis of how the rig time was spent. Fig. 9.

prepared for our monthly tool pusher meetings. Here every cost of operating and maintaining equipment is presented in graphic form. This provides the pushers with an opportunity to see what other men in their areas are doing and how they are performing. It raises questions and it brings out answers. We've found that not only are we being able to extend our good habits but we're slowly eliminating our bad habits, and for the first time our pushers are realistically appraising the economic needs of their rigs.

Statement of Drilling

Earlier I mentioned that this well is now history, with the recording of its costs serving two purposes for us: (1) assisting in future bidding and in equipment design and usage; and (2) telling us whether we made or lost money. As simple as the second point sounds, I believe you will agree it is not. It depends entirely upon the accuracy with which you accumulate your direct costs and spread your indirect costs.

Fig. 6 summarizes the cost data



HELMERICH & PAYNE, INC.

RIG NO. 44

COMPANY SINCLAIR O.&G. LEASE HENRY HARRIS WELL NO. ____

LOCATION NE NE SECTION 18 TOWNSHIP 15 S RANGE 38 E

COUNTY LEA STATE NEW MEX. SPUD 12-31-50 RELEASE RIG 5-11-51

TOTAL DEPTH 11,988' TOOL PUSHER RAY MARSH

RIG SPECIFICATIONS

DRWS. OILWELL ENGS. NO. 6 H.P. 675 MOD. WAUKESHA

PUMP NO. 1 OILWELL 810 PUMP NO. 2 330 P O.P. 6 5/8", 6 5/8"

TOOL JT. FLASHWELD O.C./NO. 20 FT. 600 O.D. 7" & 8" I.D. 2 1/2"

CASING RECORD

SURF. HOLE SIZE 17 1/2" CSG. 13 3/8" CMTD. 500 FT. 500 SX. 400

INT. HOLE SIZE 12 1/4" CSG. 9 5/8" CMTD. 4496 FT. 4496 SX. 1000

OIL STR. HOLE SIZE 8 3/4" CSG. 7" CMTD. 11,988 FT. 11,988 SX. 300

DRILLING TIME SUMMARY - DAYS

RIG UP 2 1/2 TEAR DOWN 1 1/2 DRILLING 59 REAMING 1/2

TRIPS FOR BITS 13 1/2 PUSHING ____ RIG REPAIR 1/2 LOST CIRC. 1/2

RUN CSG. & WOC 7 DAY WORK 10 SLOPE TEST 1 1/2

FOOTAGE DELAY ____ TOTAL 91

WITH DRILL PIPE ____ WITHOUT DRILL PIPE ____

BIT SUMMARY

TOTAL BITS USED 31 BITS USED ON DAY WORK ____

BREAK DOWN 1 - 17 1/2" 8 - 12 1/4" 44 - 8 3/4" ____

MISCELLANEOUS

FUEL SOURCE BUTANE WATER SOURCE WATER WELL

FORMATION TOPS YATES 1806' GRAYBURG 3956'

SAN ANDRES 4346' SILURIAN 11,002'

THE CHART above gives the drillers something to shoot at and permits them to see how the actual rig performance stacks up against the estimated performance. Fig. 10.

THE TABLE at left accompanies the above chart, and summarizes the essential information about this particular well.

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Only three feet long, the Model "E" Retrievable Casing Packer has the same rocker-type slips and proven dependable packing element used so successfully on BAKER retrievable squeeze tools. No drag springs to make a long, cumbersome tool. No slip tie-links or guide grooves to allow the slips to become stuck or cocked. No restricted bore to prevent running instruments through the packer.

Easy to run (just rotate to the right and set down) and easy to retrieve (just pick up the tubing) the BAKER Model "E" Retrievable Casing Packer is a model of high-performance in a small package.

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"We are hopeful that, in the years to come, the type of information shown here will be used throughout the industry; that the contractor will be able to present a more business-like picture of what he's doing."

contained in the earlier sheets and compares them with the income, both for footage and day-work drilling. It arrives at a percentage of profit or loss based on total cost, essentially because we are bound to the industry standard of thinking of profit or loss in these terms. But, I believe you will recognize that there is a potential weakness in this standard, in that it neglects how much investment is required to do the job. The same percentage of profit on cost using a heavy rig yields less return to us than when using a lighter, less expensive rig. So we use a percentage of return on investment, although not shown in this sheet, for our evaluation of performance and profitability.

Profit-variance analysis . . . Fig. 7 takes our understanding of the profitability of this well a little further. It simplifies just exactly how and why the well's financial results occurred, again tied in with respect to our estimate—the bid. Now we know whether we were helped or hurt by shorter or longer drilling time than predicted, or by different operating or variable costs, or by the operator's going above or below estimated total depth. This sheet is really the final stage for Helmerich & Payne in the use of cost information to assess profitability.

Closely related to cost controls are operational controls; in fact, costs derive from operations, and by controlling either you affect the other. Fig. 8 gives an indication of how we attempt to translate cost control into its original language—the actual drilling process.

First, before we commenced this well we gathered all information which would assist the tool pusher in drilling it. The operator's people obviously knew the most about it. They had geologists contour the proposed location; they knew the formations, the mud problems, and the lost-circulation problems. They knew many of the things in compiling their AFE that would be useful to the contractor.

Now as a matter of policy, our company makes every attempt to collect from the operator's exploitation department all of the information pertinent to our drilling of that well. It is condensed into the form shown in Fig. 8 by our drilling engineers and gone over in detail with our pusher before the well commences. It doesn't answer all our drilling problems, but at least it gives our pusher a road map of the well he is to drill.

Fig. 9 is an operational control which is prepared after the completion of the well to help us set standards for future bidding and for equipment design. It is a simple analysis of how the rig time was occupied. It is clear that you have to know what your equipment's time is spent doing before you can thoroughly understand how the costs arose in its work.

Measuring rig performance . . . The final operational control is used before, during, and after the drilling of the well. We needed a standard to be sure that the number of days estimated in our bid was correct, one by which we could evaluate the progress of wells currently being drilled. Fig. 10 is a form we have devised to establish such a standard. One copy is on each rig, each district manager has copies for the rigs in his area, and we have copies in Tulsa not only for our domestic rigs but also for our rigs operating in Venezuela.

Let's look at this chart for a minute. The dashed line is prepared by our engineers in first making our bid. It is an average of all the control wells in the area in which we intend to drill. Perhaps it will be 1 or 2 wells, possibly 10 or 15. From that plotted line we make our actual bid. In addition to the bid line, or the standard we set, we find that in adding another line, the continuous thin one on the chart, it sets a little tougher goal because it is always the best well that has ever been drilled in the area—too often, perhaps by a competitor.

With these two lines we found that there was one other useful index for efficient operation, viz., bit time on bottom. Now was that good? We analyzed hundreds of past drilling wells and came up with what we thought was a standard for good operation, a standard that is represented by the two lines identified as 50% and 75% time on bottom. If we can maintain an average somewhere between that we are doing all right. This graph is distributed to the rig, to the district, and of course our copy is kept in Tulsa. Then it is kept up daily.

A column for the geological formations will be noted to the left in Fig. 10. The next column is the number of bits and the footage they make. The next is hole deviation, then bit weight, and then the basic part of the graph which contains the lines just discussed. Here, then, we have direct day-to-day operational control of all equipment. If this standard is met and our costs are correct, we have for the first time good control of our drilling equipment.

In closing, I should like to stress one point. The drilling contractor's place in the industry is to provide service for the petroleum producer. If he cannot adequately provide that service, he has no place in this industry. On the other hand, if he does provide a useful service to the producers then he must have and must maintain a fair profit to stay in this business.

His equipment must be replaced. He must continuously purchase new items of equipment. He should be spending money on basic research which could ultimately save the producer millions of dollars. To do all these things the contractor's profit must be a fair one. We think facts establish that the drilling contractor has not had a fair return on his invested capital during recent years, that his profit has not been adequate to maintain, to build, to expand his services.

We are hopeful that, in the years to come, the type of information shown here will be used throughout the industry, that the contractor will be able to present a more business-like picture of what he's doing. We are very hopeful that this type of information will at least be a start in the right direction to better understanding between the contractor and the operator.

World Briefs

Ftalital S.p.A., Milan, will build Italy's first maleic anhydride plant at Scanzorosciate (Bergamo). The plant will have a capacity of 2,200,000 lb. per year. Scientific Design Co., Inc., and an affiliated company, Ste. Francaise des Services Techniques, S.A., of Paris, will do the process engineering and major equipment design.

Development drilling in the Jobo area of eastern Venezuela has been resumed by Pan Venezuelan Oil Co. The company's J-6 outpost well is being logged after reaching a final depth of 4,140 ft.

The route has been set for a 600-mile crude pipeline from Russia through the center of Czechoslovakia. Spreads are expected to start moving in 1960.

Completion of Union's new Oleum receiving terminal meant no boost in manpower as

Automation pays off at pipeline terminal

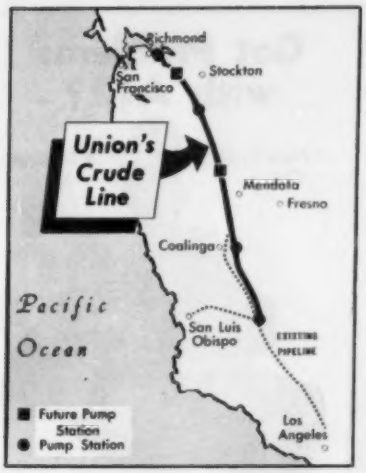


FIG. 1.

BY DEAN SANDFORD
Operating Engineer, Union Oil Co. of California

THE RECEIVING terminal and pump station on Union Oil Co.'s new San Joaquin Valley-Oleum crude line contain some outstanding automatic features.

The Oleum terminal, with which this article is primarily concerned, does not require the constant attendance of an operator. The terminal operator monitors operations from the central control room, but is free to attend to his normal gaging duties. Adding the new terminal did not increase manpower requirements.

In designing the terminal a basic consideration was to tie in with existing refinery facilities, using existing piping and tanks. Service of existing refinery piping and tanks was revised to minimize construction of new facilities. Safety of personnel and equipment also were of paramount importance in the design and selection of equipment.

Automatic operation of the terminal is primarily achieved through the following:

... **Twin receiving manifolds** are connected to each receiving tank and a motor-operated three-way valve switches flow from one manifold to the other when a new tender is received.

... **Capacitance analyzers** sense the incoming new tender and energize controls for carrying out the automatic switch.

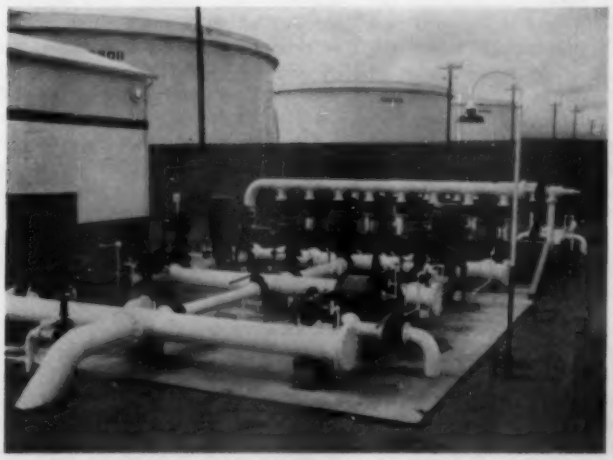
... **Pressure controllers** operate to keep the line packed, thereby minimizing the amount of interface contamination between tenders.

Continuous sampling on a volume basis is automatically switched with the arrival of a new tender. Tank gaging is remotely carried out by means of a pulse-type gaging system. Meter proving is accomplished under actual operating conditions using a 140-bbl. weir-type volumetric prover tank.

Pipeline Operations

Prior to the completion of the new San Joaquin Valley line, tankers were used between Avila and the Oleum refinery. In this operation light and heavy valley crudes were moved by pipeline from the valley to the coast. These crudes, plus gas oil and pressure distillates from the Santa Maria coking plant and enriched crudes from the Orcutt area, then were shipped by tanker to the refinery.

The new San Joaquin Valley-Oleum carrier completely changed this picture. As is shown in Fig. 1, flow through the valley-coastal line has been reversed. Enriched coastal crudes



MANIFOLD and metering equipment at the Coalinga station. Proving tank for the meters is housed in the building shown at left. Fig. 2.

CONTROL ROOM at Coalinga from which the Patterson station, 100 miles away, is remotely operated by microwave. Fig. 3.

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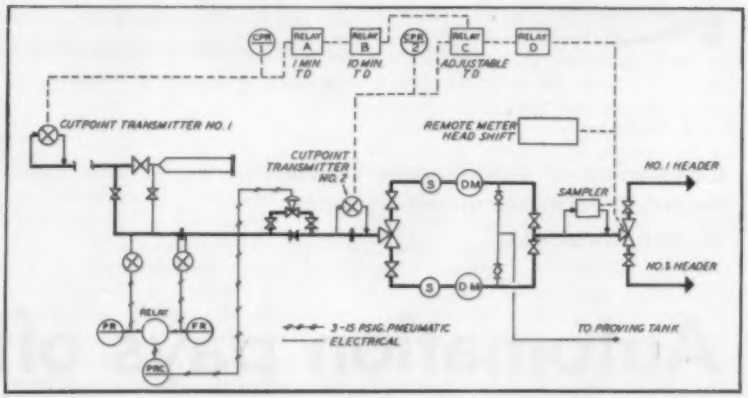

PRESSURE and automatic switching controls at the Oleum receiving station. Fig. 4.

and coker distillates now are pumped eastward to the Junction station.

There San Joaquin heavy crudes are diluted with about 25% of Santa Maria coker distillate in order to obtain more economical pumping conditions. This diluted crude, plus valley light and waxy crudes and coastal crudes and products, then are shipped through a new 42-mile, 12-in. line to a new station near Coalinga (see Fig. 2). There waxy crudes from Coalinga field join those from the south.

Shipping rates through the 180-mile, 16-in. line to Oleum vary between 40,000 and 80,000 bbl. daily at discharge pressures up to 1,000 psig. Tender sizes range between 4,000 and 250,000 bbl. Since about 3½ days are required to move a tender through the line at a 65,000-bbl. flow rate, several tenders are generally in the line at one time.

Under present operations a remotely controlled satellite station at Patterson boosts the pressure again to approximately 1,000 psig. whenever the flow rate requires its use (see Fig. 3). Future pump stations are planned for Panoche, midway between Coalinga and Patterson, and at Byron. These would boost the line's throughput to a maximum of 120,000 bbl. daily.

The various commodities are pumped through the line without batching pigs or buffer zones. Thus four steps are taken to minimize interface contamination between tenders. These are:

1. Flow rates are kept above 30,000 bbl. daily to assure turbulent-flow conditions.
2. Sufficient back pressure is held to completely pack the line.
3. Switching between tenders is properly timed at both the pumping and receiving stations. No interface slopping facilities are provided at Oleum, thus the contaminated interface is over or undercut according to the commodity being received.
4. Commodities in which intercontamination is critical are not scheduled back to back.

Receiving Terminal

At Oleum, where the receiving terminal is operated by refinery personnel, the line's output is received, metered, and stored with minimum supervision. The operator works out of the terminal control room and periodically checks the instrument panel. Otherwise he goes about his normal gaging duties while the line's output is automatically metered and sampled. He makes tank lineups in advance of a change in commodity but switching is performed automatically.

At the terminal a 10-in. receiving line takes off the main 16-in. line immediately upstream from the scraper trap. Below this point an orifice for a flow recorder and a back-pressure control valve are installed, followed by a restriction orifice for diverting a 1-in. slip stream to a cutpoint detection probe.

Metering is carried out through two displacement meters connected in parallel. A motor-operated valve switches the flow between meters during proving operations. An 8-in. fill line to the meter-proving vessel is manifolded to the meter outlets.

Continuous sampling is carried out by means of a slip stream circulated from the 10-in. line immediately upstream from the receiving manifolds. A sample proportional to the pipeline flow rate is obtained as explained later on.

Pressure control . . . Successful operation depends on a packed line being maintained, so there will be no intermingling of two commodities while running down a partially empty line. Excessive back pressure at the receiving terminal needlessly increases pumping costs and limits the pipeline throughput.

Ideally, a pressure controller placed at the high point could be used. By throttling a control valve at the receiving station to maintain a slight pressure at the high point, a packed line would be assured.

High point of the line, unfortunately, is about 30 miles south. This distance, plus inaccessibility of the line in the rugged country near Mount Diablo, prevents use of this remote-control method.

However, since the pressure drop due to friction loss in the 30-mile decline depends on the flow rate, the latter can be used as an indication of pressure loss. Thus, by measuring the pressure at the terminal and pressure drop (flow rate), pressure at the high point can be determined and regulated to insure a packed line. This is achieved as follows:

Flow rate at the terminal is measured by a flow-rate transmitter immediately upstream from a double-ported pressure control valve (see Fig. 4). The transmitter sends a 3-15-psig. air signal to a flow recorder on the instrument panel. It also transmits to a pneumatic relay on the panel board.

Pipeline pressure is similarly measured by a pressure transmitter which sends a 3-15-psig. signal to a panel-mounted recorder and to the pneumatic relay.

In the pneumatic relay the two 3-15-psig. air input signals are averaged and an single 3-15-psig. signal is produced which is proportional to the average of the two input signals. Output signal from the relay serves as an input to a panel-mounted pressure controller which throttles the pressure control valve in the 10-in. receiving line.

Set point for the pressure controller normally is about 490 psig. This is about 50 psig. greater than the total static pressure required at the terminal to maintain a packed line. Should the output from the relay drop below the set point, the controller acts to close the valve until the output of the relay

REMOTE ticket-printing meter heads in the control room which permit automatic switching each time a new tender arrives at Oleum. Fig. 5.

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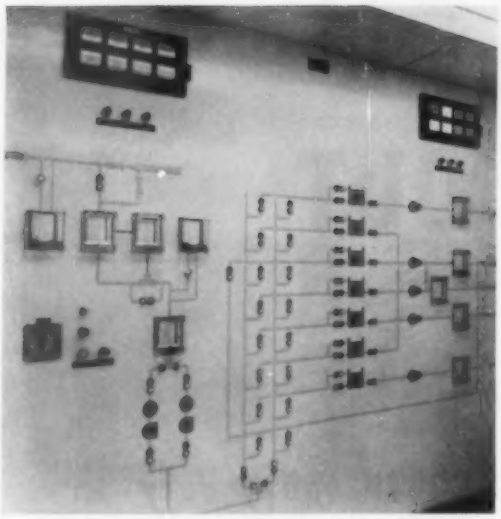
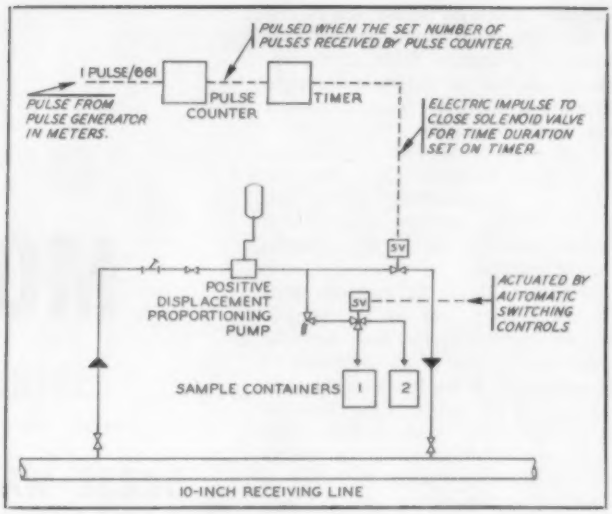


GRAPHIC panel board in the control room permits the operator to check the valve lineup in advance of a new tender reaching the terminal. Fig. 6.



SCHEMATIC DIAGRAM of the proportional sampling system used at the Oleum receiving station. Fig. 7.

returns to the set point. It likewise opens the valve when the output is above the set point.

Both the main pipeline and terminal piping are protected from overpressure by relief valves discharging into one of the receiving tanks.

Automatic switching . . . Controls actuated by two cutpoint recorders automatically switch receiving equipment each time a new tender arrives. By switching the motor-operated valve ahead of the twin receiving manifolds, the flow is switched from one tank to another. The automatic switching controls cannot function unless preset by the operator. Proportional sampling likewise is switched to a new container, and the remote ticket-printing meter heads in the control room are switched.

Some time before a new tender is due to arrive, the operator opens the proper receiving tank to the receiving header which is then idle and places a second container at the continuous sampler. He also inserts tickets in the heads of the idle remote counters and prints the start readings (see Fig. 5). After setting the desired time delay to cut the interface at the proper point, he then energizes the automatic switching controls by pressing a ready button on the control panel.

Valve-position indicating lights on the graphic panel board permit the operator to graphically check his lineup prior to the switch (see Fig. 6). Each main block valve in the terminal is represented on the board by a red and a green light. One burns brightly while the other is dim, signifying an open or closed valve. A light that is not lit indicates a burned-out bulb or a faulty electrical circuit. All board-mounted instruments are the miniature type located graphically in the terminal flow layout.

Warning that an interface change is arriving is given by a capacitance analyzer placed 4,000 ft. up the line from the terminal. This continuously measures the dielectric strength of the commodity in the pipeline and transmits an electric signal to a recorder on the panel board.

A change in the dielectric strength of the commodity in the pipeline causes a change in the pulsed signal from the transmitter. This change causes a movement of the recorder pen, sounds an alarm, and energizes time delay relay **A**. If the dielectric strength continues to change for a period of 1 minute, relay **B** is energized. It closes approximately 10 minutes after being energized by **A**. The automatic switching controls cannot be actuated unless relay **B** has been energized.

The second analyzer measures the dielectric strength of the commodity after it has entered the receiving station. A change in the dielectric strength causes a change to register on the chart of the panel-mounted recorder. It also energizes adjustable time-delay relay **C**.

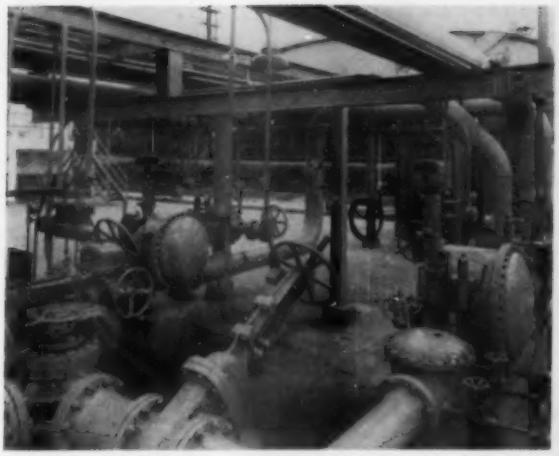
When the preset time has expired which determines whether the interface goes into the first or second tender, relay **D** is energized. It operates to shift the motor-operated valve and cause flow to change to the other manifold. The remote counter heads also are shifted, and a solenoid-operated three-way valve in the sampling line is shifted so that the sample goes to a new container. Operation of relay **D** includes a few seconds' delay to permit the interface to travel from the detection probe to the manifolds before the switch is made.

At any time after the switch is completed the operator can close the tank valves, remove the sample container, and print the closing readings on the meter tickets.

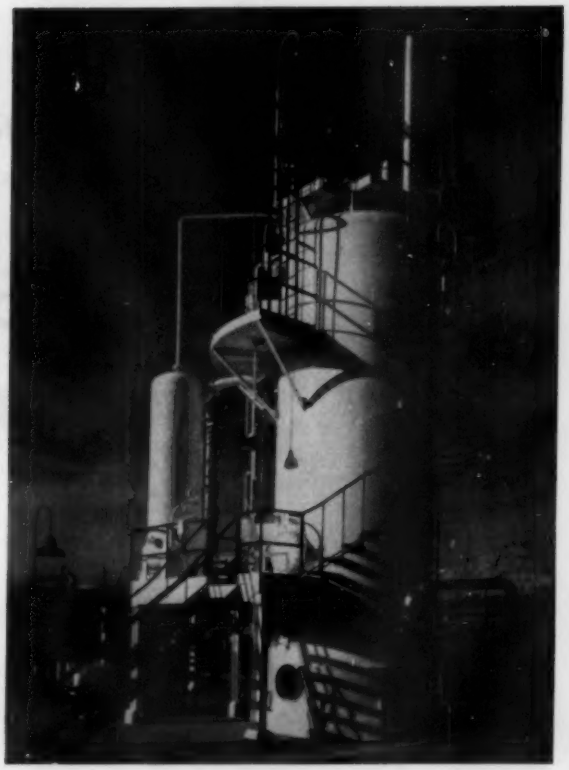
Automatic sampling . . . A continuous sample proportional to the rate of flow through the line is obtained by means of a high-pressure, positive-displacement metering pump with an adjustable stroke. As diagramed in Fig. 7, a slip stream is circulated from the 10-in. receiving line. A portion is withdrawn to the sample container and the balance is returned to the 10-in. line through a solenoid-operated valve. The average sample consists of many small samplings taken each time a preset number of barrels passes through the meters.

Adjustable features of the system permit approximately a 1-gal. sample to be obtained from each tender regardless of the size of the shipment. Length of stroke is adjustable between the ranges of 0.0173 and 0.173 gal.

"At any time after the switch is completed the operator can close the tank valves, remove the sample container, and print the closing readings on the meter tickets."



PARALLEL METERING banks in the receiving terminal permit one meter to handle the flow while the other is held in readiness for a new tender. Fig. 8.



VOLUMETRIC PROVING TANK used for checking the meters' accuracy has top and bottom weir plants so that exact levels can be established at beginning and end of each proving run. Fig. 9.

per hour. The number of barrels per sample can be varied by adjusting the pulse counter, and the length of sampling time or size of each sample can be varied by means of a timing control on the sample pump.

With the pulse counter set to call for a small sample each time a set number of barrels passes through the meters and the pump stroke in a fixed position, the amount of sample withdrawn for each barrel passing through the meters is set by adjusting the timer. The pulse transmitters actuate the timer, which in turn closes a solenoid-operated valve in the sampling line. This blocks the pump discharge and forces flow through a back-pressure control valve into the sample container.

Metering . . . The two meters used are 8-in. Brodie two-rotor units with a rated capacity of 3,300 bbl. per hour. They are installed in two parallel banks as shown in Fig. 8. Each is provided with a pulse generator, transmitter, stop-and-reset device, and field head consisting of a totalizer and reset totalizer. The reset totalizers are used in meter-proving operations and are calibrated in 0.01 bbl. The field stop-and-reset devices also are used only in meter proving.

The transmitters send electric signals to two remote counters located in the control room. Each counter consists of two identical heads and an electric shifting mechanism. The input signal is switched from one head to the other when a new tender is received. Either counter may be operating depending on which meter is in service.

Meter-proving facilities prove the meters on all commodities under actual operating conditions. They are proved to an accuracy of 0.05% (volume) on the raw material received from the pipeline. By using meter coefficients, the pipeline volume metered is corrected for differences in commodity and in operating conditions.

The proving tank, shown in Fig. 9, is a 140-bbl. weir-type volumetric vessel designed to API specifications. The two-section vessel has a top and a bottom weir plate which establish exact levels at the beginning and end of a proving run. Should this measuring section be overfilled, the material is caught in a lower 60-bbl. section which serves both as an overflow and drain chamber.

The vessel is filled through an 8-in. line manifolded to the outlets of both meters. The proving vessel is protected from overpressure by relief valves which discharge through the terminal relief system into a nearby receiving tank.

When proving a meter, the one which is not in operation is lined up to the proving tank. The stop-and-reset device on the meter is set for about 135 bbl. and the pipeline opened to the meter by switching the motor valve ahead of the meters. When the preset quantity has passed through the meter being checked, the valve automatically switches and flow resumed through the original meter.

Overflow from the large proving vessel goes into an 8-bbl. gage tank. Initial and final readings, in 0.01 bbl., are obtained from this vessel. Both vessels are gas blanketed and vented to the refinery smokeless flare through a pressure-control system. This is done to eliminate the emission of odorous material. The meter-proving operation is repeated until three meter coefficients are obtained within a range of 0.0005.

Communications . . . In addition to being recorded in the control room, the following information is automatically transmitted by microwave to the Coalinga pump station:

1. Barrel count from the pulse transmitter of the meter that is in operation.
2. Chart reading of cutpoint recorder.
3. Receiving pressure.
4. Pipeline temperature.
5. Relief-valve alarm, in the event faulty operation or equipment failure causes excessive pressures.

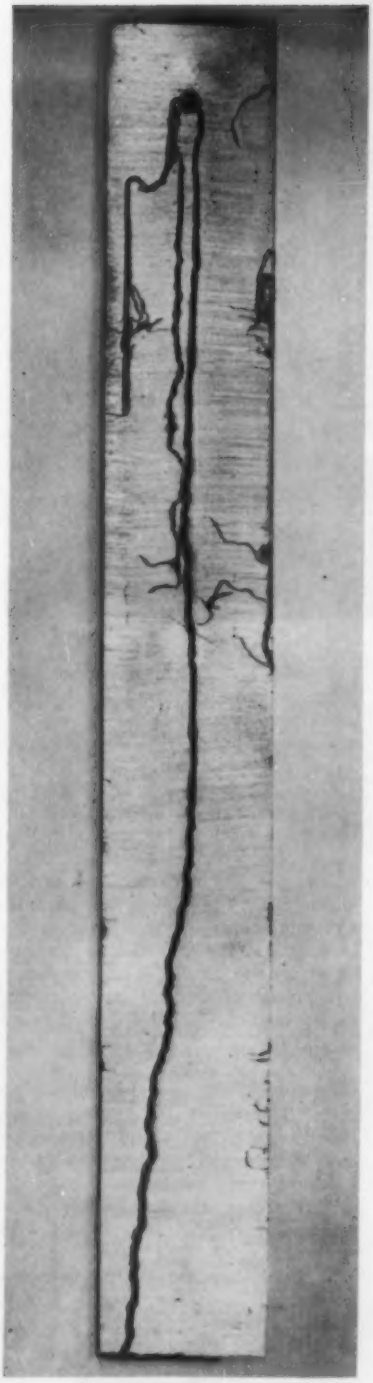
In addition to teletype, the operator of the receiving equipment contacts the dispatcher by voice microwave.

With simple tests and magnified photos, researchers are able to take . . .

A close look at filiform corrosion

—and come up with means of protection

BY J. D. SUDBURY, O. L. RIGGS, AND J. F. LETERLE
Continental Oil Co.



ACTUAL SIZE of the 1 by 8-in. mild-steel coupon used in corrosion tests is shown above. The filaments start at the edges of the coupon and grow rapidly. Corrosion occurs beneath the filament, which is composed of the corrosion product. Fig. 1.

VISUAL OBSERVATIONS were made of the nature of corrosion occurring when mild-steel specimens were immersed in an unstirred, aerated, 1% diethanolamine (DEA), 5% sodium chloride (NaCl) brine. A record of the observations of this corrosion over a 3-day period is presented in a 3-minute time-lapse movie.

It is noted that a highly directional type of corrosion begins at sharp edge of the 1 by 8-in. mild-steel coupon. It grows rapidly (up to ½ in. per hour) in the form of thin, threadlike filaments, as pictured in Fig. 1. The metal surface beneath the filament is severely corroded. This unique type of corrosion has been designated as filiform corrosion.

Characteristics . . . Some characteristics of this interesting filiform corrosion are mentioned herein. It is planned that a more detailed mechanism study will be presented in a future paper.

Paper presented at annual meeting, API Division of Refining, Los Angeles, 1958, under the original title, "Corrosion Studies in Alkanolamine Solutions."

The filiform type of corrosion has been observed in a variety of alkanolamine systems, including the following: (1) monoethanolamine, (2) diethanolamine, (3) methyldiethanolamine, (4) dimethylethanolamine, (5) diethylethanolamine, and (6) diethylhexylethanolamine.

Alkanolamines which did not cause filiform include: (1) triethanolamine, (2) n-butyl diethanolamine, (3) monoisopropanolamine, (4) triisopropanolamine, and (5) dibutylisopropanolamine.

Other amines such as morpholines, ethyleneamines (piperazines), and imidazolines do not cause filiform.

The nature of the filament can best

The authors say:

- Laboratory studies of DEA gas-sweetening systems led to the observation of filiform corrosion. This corrosion is highly directional and is characterized by the formation of long, narrow, hollow, thread-like filaments of the corrosion product.
- This filiform corrosion is a special form of an oxygen concentration cell in which the anode, or head of the filament, is fed by corrodent passing through the hollow tube in the tail.
- An inhibitor was developed to successfully control filiform and pitting corrosion in laboratory DEA-brine solutions.
- Field tests of this experimental inhibitor have been successful for short periods in two corrosive refinery Girbitol systems.

be understood by examining the diagram in Fig. 2. The filament itself may be divided into two major portions: the head and the tail. The head, or growing portion of the filament, is covered by a light blue-green product of corrosion.

This is quickly oxidized to the orange-colored stable product which makes up the bulk of the filament (B). This product is covered with a thin greenish-black layer (A). The exact chemical composition and structure are not known but the product of corrosion is an iron-amine complex. The filaments are some 2 to 3 mm. in width and grow at rates of up to ½ in. per hour.

Below the filament, the metal has been corroded away. The filament itself is hollow throughout its entire length. A cross-section of the hollow tube is shown in Fig. 3. This hollow tube is filled with electrolyte which has a pH of less than 4.0, whereas the bulk solution has a pH of approximately 12. This low-pH fluid is undoubtedly the anolyte for an electrochemical cell. The pH of 1.0 molar iron chloride ($FeCl^2$) is 2.6.

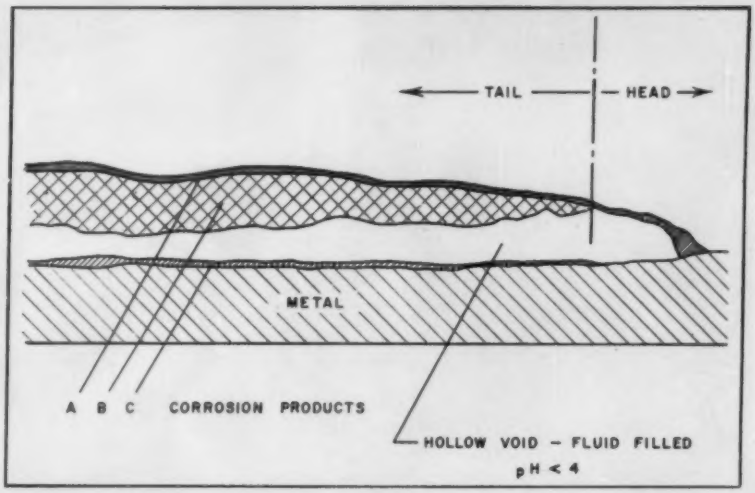
The cell action is apparently sustained by the flow of electrolyte entering the tube at the tip of the tail and flowing through the tube to the head. This is in contrast to the filiform under paints where no hollow tube is reported and corrodents are believed to feed through the filament walls.[1-5]

Some of the interesting factors affecting the rate of growth of the filament can be listed. A detailed discussion of these points is beyond the scope of this paper.

1. The filaments usually start growing at sharp edges of the coupons. These spots are presumed to be anodic. By making a portion of the coupon the anode of an electrochemical cell, filaments are readily initiated. By making the coupon the cathode, no filaments can be induced. An existing filament grows toward any point which has been made anodic by external current application.

2. The general direction of growth of the filaments is downward. Very few filaments grow against gravity. On a horizontal coupon surface, filaments follow gross imperfections caused by polishing the coupon.

3. The rate of growth of a filament is increased several fold by cutting off part of the tail. This is believed to enlarge the hole through which the electrolyte enters the filament. On the other hand, if the tip of the tail is sealed off, the cell is immediately stifled. This seems adequate proof of the role of the hollow tube in the corrosion process.



A CROSS-SECTION of a corrosion filament looks like this. The material at the top is what shows in the closeup photo (Fig. 1), indicating how the corrosion travels. Fig. 2.

MAGNIFIED CLOSEUP of an actual cross-section of a hollow filament shows shape of the filament. The hole in the center has an actual diameter of about 0.3 mm. Bottom of the photo shows the steel surface of the metal coupon. Fig. 3.

4. The filaments never cross each other.

5. The type of mild steel or its surface preparation has no great effect.

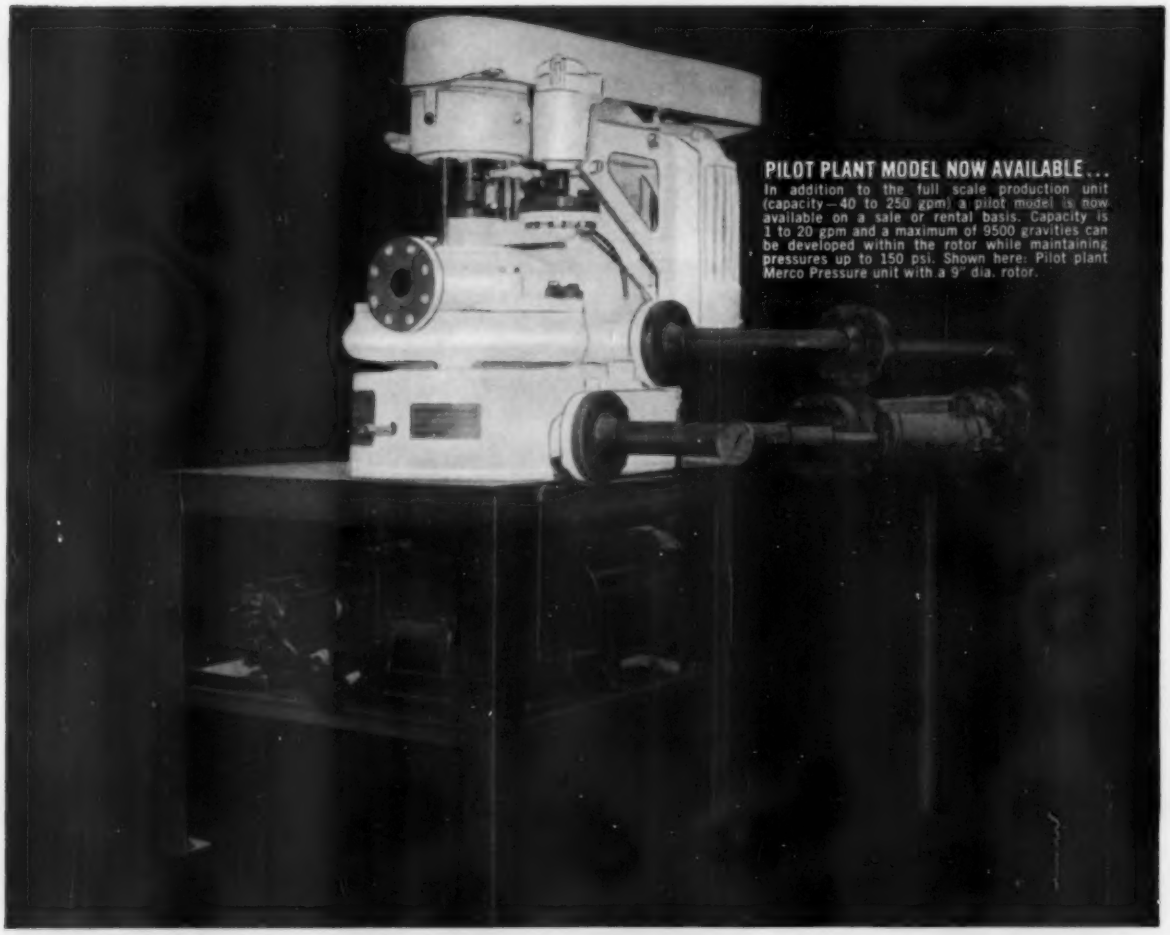
6. Filiform corrosion occurs in both sodium chloride (NaCl) and sodium sulfate (Na_2SO_4) brines.

7. Growth is stifled by the removal of oxygen from the system.

DEA Corrosion Tests

A dynamic corrosion test was set up to simulate more closely the conditions of DEA corrosion in a field Girbitol system. A three-necked, 1-l., round-bottom flask was assembled, as shown in Fig. 4, then filled with the same corrosion-test solution as in the static test. The solution was stirred for complex mixing of the chemical, and the stirring was continued during the test period.

Hydrogen sulfide (H_2S) and carbon dioxide (CO_2) gases were passed through the liquid at 0.5 l. per minute. The temperature of the test liquids was raised to 200° F. A vertical condenser attached to one neck prevented evaporation loss. The coupon was exposed to these test conditions for 24 hours. Surface-corrosion observations



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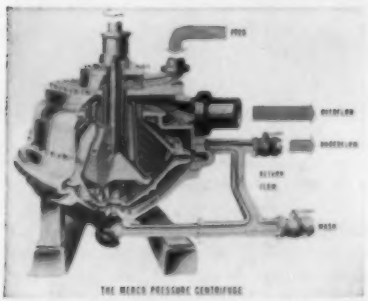

Illustrative drawing of a full scale Merco Pressure Centrifuge with a 30" dia. rotor bowl.

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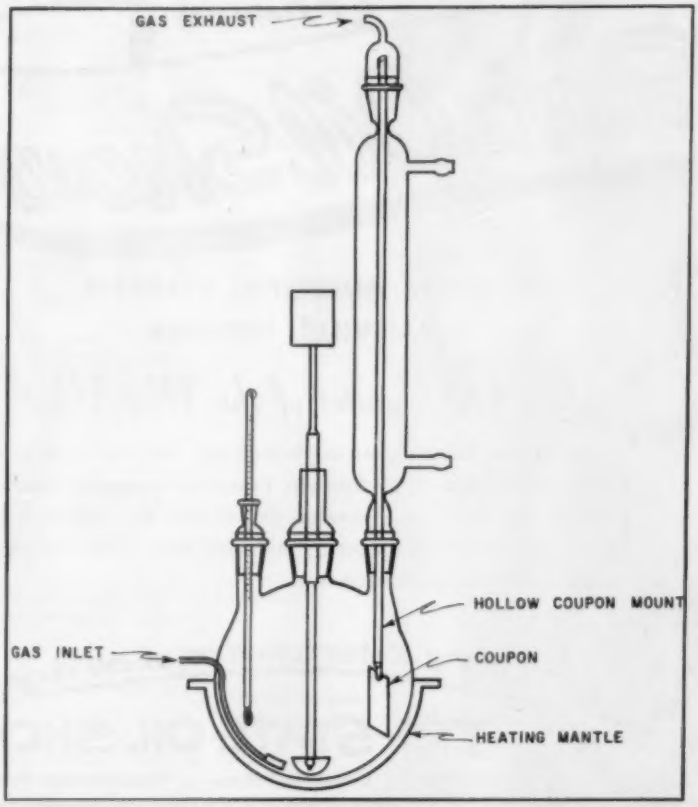


THREE-NECKED, single-liter, round-bottomed flask is used to simulate the conditions of DEA corrosion in a field Girbitol system. Gases were passed through the liquid and the temperature was raised, to see what effect the corrosion-test solution would have on the coupon. Fig. 4.

were made at the end of the test. The weight-loss measurements were determined, from which corrosion rates and per cent protection were calculated.

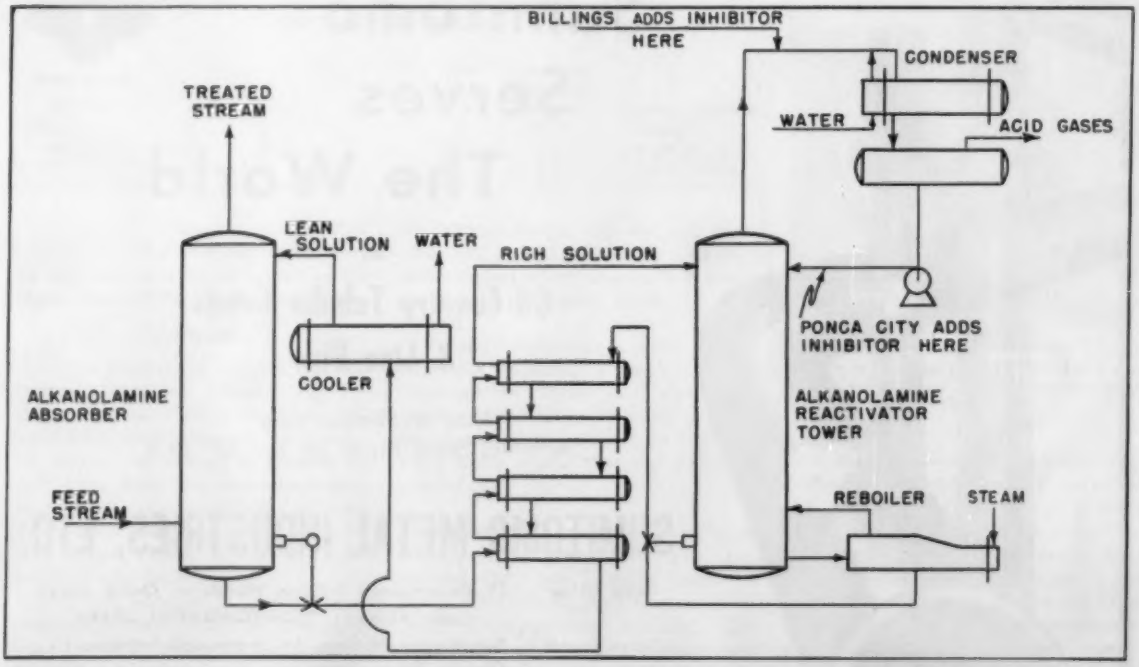
Corrosion-inhibitor tests . . . Several known corrosion inhibitors were added to the filiform-producing DEA and monoethanolamine (MEA) systems. None of these inhibitors were effective in preventing the initiation and growth of filiform. Numerous organic materials were screened in an attempt to prevent filiform. The only type of material shown to be effective was a condensation product of polyethyleneamines and unsaturated alcohols.

The general formula of these materials may be written:

$$R\,N\,\begin{matrix}H\\C\\H\end{matrix}-C\equiv C-\begin{matrix}H\\C\\H\end{matrix}-OH \qquad (1)$$

where R N represents the polyamine (such as tetraethylenepentamine). Table 1 presents a summary of these data.

The corrosion rate of the dynamic system was 96 mils per year. The surface attack caused small pits over the coupon. The two most effective commercial inhibitors, Imidazoline and Rosin Amine D, reduced corrosion rates to 7.3 and 8.4 mils per year, respectively. Some pitting was detected. Tetraethylenepentamine (designated as T-52) gave almost complete in-



FLOW DIAGRAM shows a typical alkanolamine purification system, in which the lean solution absorbs acid gases from the rich amine solution, regenerating the solution. The rich solution is then treated until it is again ready to absorb acid gases from the feed system. Fig. 5.

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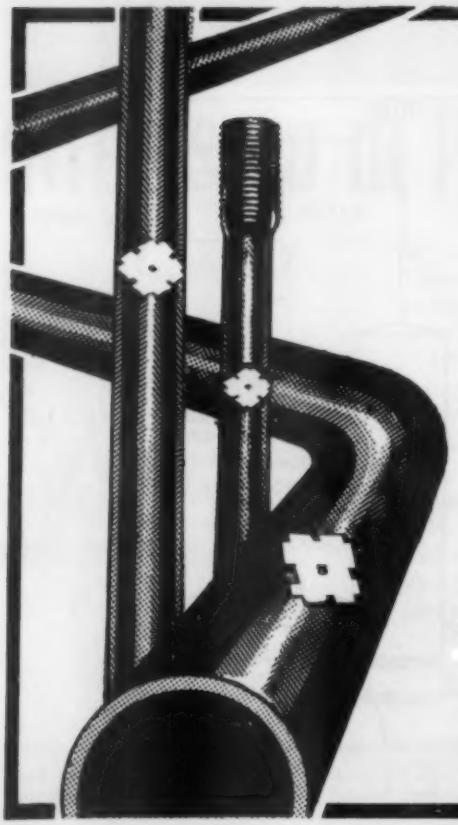

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hibition with an 0.8 mil per year corrosion rate.

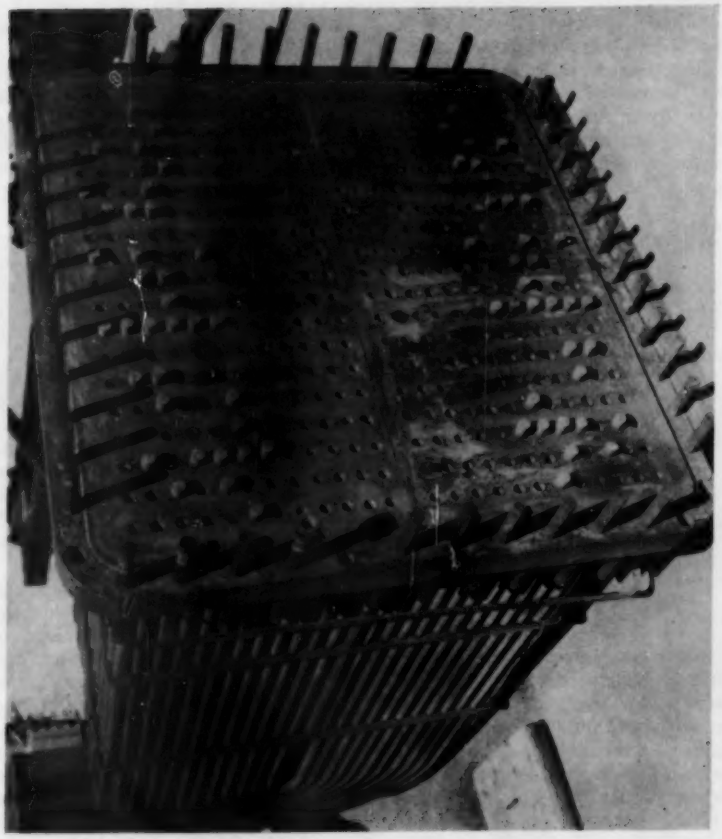
TABLE 1—EFFECTS OF CHEMICAL ADDITIVES ON FILIFORM CORROSION IN MEA* AND DEA†-BRINE SYSTEMS

Chemical treatment, 100 p.p.m.—	Filiform corrosion occurs
Tetraethylenepentamine—butynediol (T-52‡)	No
Diethylenetriamine—butynediol	No
Triethylenetetramine—butynediol	No
Commercial Imidazoline inhibitor	Yes
Commercial Rosin Amine D inhibitor	Yes
Sodium chromate	Yes
Sodium nitrite	Yes
Tetraethylenepentamine	Yes
Diethylenetriamine	Yes
Triethylenetetramine	Yes
Imidazoline sulfate	Yes
n-Acetyl ethanolamine	Yes
Aminoethylethanolamine	Yes
Dibutylisopropanolamine	Yes
Phenyl ethanolamine	Yes
Pyrogallic acid (as an oxygen scavenger)	Yes
Tetraethylenepentamine—pyrogallic acid	Yes

*Monoethanolamine. †Diethanolamine. ‡Reaction-product designation.

No surface attack was detected. These results are listed in Table 2, and show that T-52 controls filiform and pitting corrosion in laboratory DEA systems. Based on these encouraging results, plans were made to evaluate this inhibitor in refinery gas-sweetening units.

It should be remembered that the laboratory tests were all run in the liquid phase. There is no certainty that the inhibitor will reduce the very serious corrosion often found in the vapor phase of the reactivator column.



CORKS inserted into 16% of this failed carbon-steel reactivator reboiler bundle at Ponca City, Okla., indicates the corrosion which has taken place. Fig. 6.

TABLE 2—EFFECT OF INHIBITORS ON CORROSION IN A 1% DEA,* 5% SODIUM CHLORIDE BRINE SATURATED WITH HYDROGEN SULFIDE AND CARBON DIOXIDE

Chemical—	Concentration (p.p.m.)	Corrosion rate (mils per year)	Surface corrosion
None	0	96	Pitting
Commercial Imidazoline	250	7.3	Slight pitting
Commercial Rosin Amine D	250	8.4	Slight pitting
Polyethyleneamine and unsaturated alcohol	250	0.8	None detected

THIS TUBE was cut from the bundle shown in the top photo. Its severe corrosion was typical of the damage done to the reboiler. Fig. 7.

Field Studies

A flow diagram of a typical alkanolamine-purification system (Fig. 5) shows the lean solution absorbing acid gases from a feed stream. The remainder of the unit is used to remove the acid gases from the rich amine solution, thereby regenerating the solution. The rich solution is heated and the lean solution cooled by shell and tube-solution heat exchangers.

The rich solution is charged to a reactivator tower where the acid gases are stripped by means of heat supplied through a reboiler. The reactivated or lean amine solution is taken off the bottom of the reactivator tower, cooled by heat exchange with the rich solution, and further cooled by exchange with cooling water. Again, it is ready to absorb acid gases from the feed stream.

Refinery sweetening units usually use DEA solutions; a few use MEA. Solutions of MEA and glycol are found in the units of most gasoline plants where, in addition to H_2S and CO_2, water is also removed from the treated gas.

Field history . . . Corrosion-inhibitor studies are being made in two of Continental Oil Co.'s Girbitol units. A Ponca City, Okla., unit uses a 12 to 20% DEA-in-water solution. The gases removed from the propane feed are composed of 89.9% H_2S, 0.9% CO_2, and 2.4% ammonia (NH_3).

The carbon-steel reactivator reboiler is the only piece of equipment suffering severe corrosion. Pictures of this tube bundle (Figs. 6 and 7) show how attack is most severe under the tube supports where the crevice type of concentration-cell corrosion is active. The use of a corrosion inhibitor and a reduction of reboiler steam temperature by 100° F. did not significantly increase the useful life of this reboiler bundle.

The average life of reboilers has

only been approximately 7 months. The history of the last six units is briefly summarized in Table 3. Thickness measurements were made on tubes from the bundle pictured in Fig. 6. This bundle had been in service for 9 months before removal because of several leaks.

TABLE 3—SUMMARY OF CARBON-STEEL REBOILER LIFE IN A DEA* GAS-SWEETENING UNIT

Period in service—	Service life (mo.)
Commercial inhibitors used during this period:	
March 1954 to December 1954	9
December 1954 to December 1955	12
December 1955 to May 1956	5
May 1956 to August 1956	3
August 1956 to January 1957	5
January 1957 to September 1957	9
September 1957 to present (Still in good condition using T-52† inhibitor.)	8+

*Diethanolamine. †Reaction-product designation.

Numerous measurements of the tube diameters of this failed bundle were made. Measurements were made in the upper, middle, and lower sections of the bundle. Additional measurements were made of the tube diameter under the tube spacer where crevice corrosion occurs and where most of the failures were located.

These data are summarized in Table 4 and are all average values. Actually, some tubes were completely penetrated by small pits in the crevices. The corrosion on completely exposed portions of the bundles was mild, and no failures were found.

The Billings, Mont., unit uses an 8-18% DEA-in-water solution. The gases removed from the gas and liquid feed streams contain 75.8% H_2S, 21.9% CO_2, 0.03% carbon oxysulfide (COS), 0.08% carbon disulfide (CS_2), and 0.90% carbon monoxide (CO).

Severe corrosion has been experienced in the reactivator tower and reboiler and in the solution exchangers. Nickel-copper alloys have been only moderately successful in controlling corrosion of the reactivator tower and reboiler. The corrosion product was a mixture of iron, copper, and nickel sulfides.

A corrosion inhibitor was used for a few months, but no reduction in corrosion was observed. Photographs of the nickel-copper alloy lining in the reboiler shell show evidence of filiform corrosion having taken place (Fig. 8).

Inhibitor injection . . . The T-52 corrosion inhibitor is being used in the Ponca City unit. One quart a day is added slugwise into the reactivator-tower reflux stream to maintain a concentration of at least 200 p.p.m. The effectiveness of the inhibitor will be judged by actual equipment inspection and metal-loss measurements. This unit has now been in operation for 8 months without failure.

At the Billings plant, the inhibitor is added continuously to the reactivator overhead line by means of a proportioning pump. The dosage rate is 1 qt. per day. The effectiveness of the inhibitor will be determined by means of onstream corrosion-test coupons located in the liquid and vapor areas in the bottom of the reactivator tower.

Duplicate coupons have been run for 7 days each, to determine corrosion rates in untreated systems. The results of these tests are summarized in Table 5. The initial data after treatment with an inhibitor show a reduction in corrosion rate in the liquid phase and no reduction in the vapor phase. These tests are continuing.

TABLE 5—COUPON DATA FOR THE BILLINGS, MONT., GIRBITOL UNIT

Chemical treatment	Time-exposure interval	Corrosion rates of exposed coupons (mils per year) Liquid	Vapor
None	11-18-57 to 1-21-58	7.8	39.7
T-52*	1-21-58 to 1-28-58	5.9	33.9
T-52*	1-28-58 to 2- 4-58	4.0	35.6

*Reaction-product designation.

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TABLE 4—WALL-THICKNESS MEASUREMENTS OF TUBES FROM THE REBOILER BUNDLE AFTER 9 MONTHS OF SERVICE IN A DEA* SYSTEM

(Original outside diameter = 0.750 in. Original wall thickness = 0.083 in.)

Location of measurements—	No. of measurements made	Average o.d. (in.)	Wall-thickness reduction Avg. (in.)	Per cent
Reboiler top	17	0.727	0.012	14
Reboiler middle	42	0.735	0.008	9
Reboiler bottom	22	0.736	0.007	8
Tubes under spacer	13	0.705	0.023	28

*Diethanolamine.

ONE CORROSION INHIBITOR used at a Billings, Mont., unit failed to reduce corrosion. The nickel-copper alloy lining in the reboiler shell shows evidence of filiform corrosion. Fig. 8.

Other Articles on This Subject

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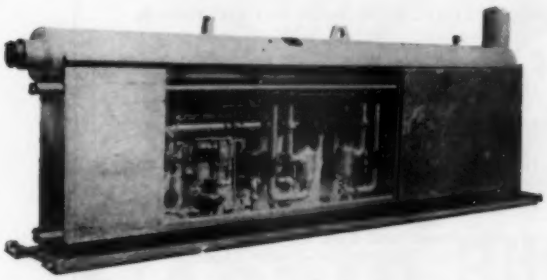

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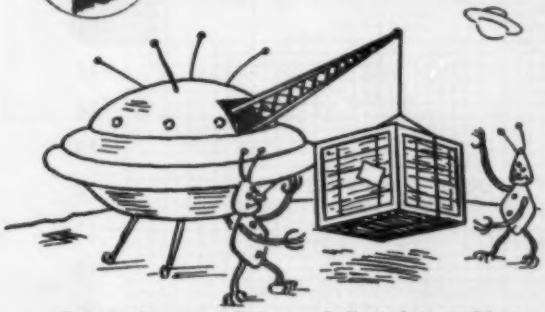

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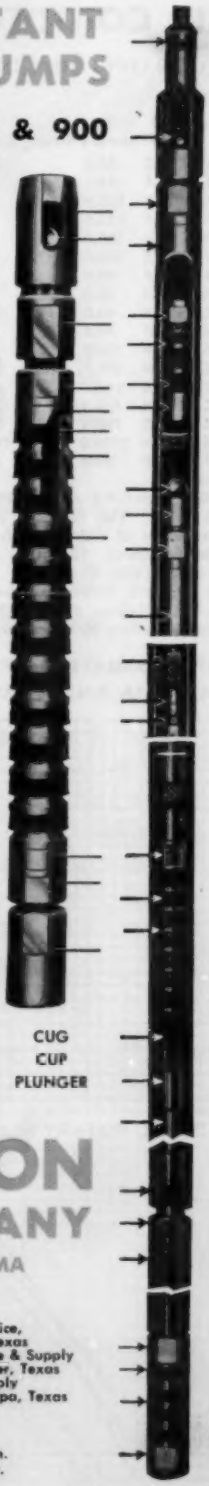

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BY W. L. NELSON
Technical Editor and
Petroleum Consultant

Air compression: power requirment and cost

OPERATING COST INDEXES

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1928	34.8	104.5	....	29.5	34.8
1930	36.8	106.0	....	29.5	35.5
1932	22.5	113.5	31.0	23.5	28.9
1934	22.5	100.0	38.0	25.0	29.8
1936	23.5	100.0	37.0	28.0	30.9
1938	22.5	95.0	36.0	34.0	33.6
1940	18.4	85.0	35.0	35.0	36.5
1942	22.5	90.0	41.0	43.0	40.2
1944	25.5	95.5	46.0	57.5	50.2
1946	30.6	106.5	53.0	73.1	58.5
1948	46.0	106.0	88.0	84.9	72.8
1950	48.0	107.0	71.0	81.5	72.4
1952	63.4	105.0	83.0	88.7	80.5
1954	86.2	108.0	88.0	90.9	88.7
1956	100.0	‡100.0	§100.0	¶100.0	‖100.0
1957	†108.0	99.0	106.0	105.7	106.8

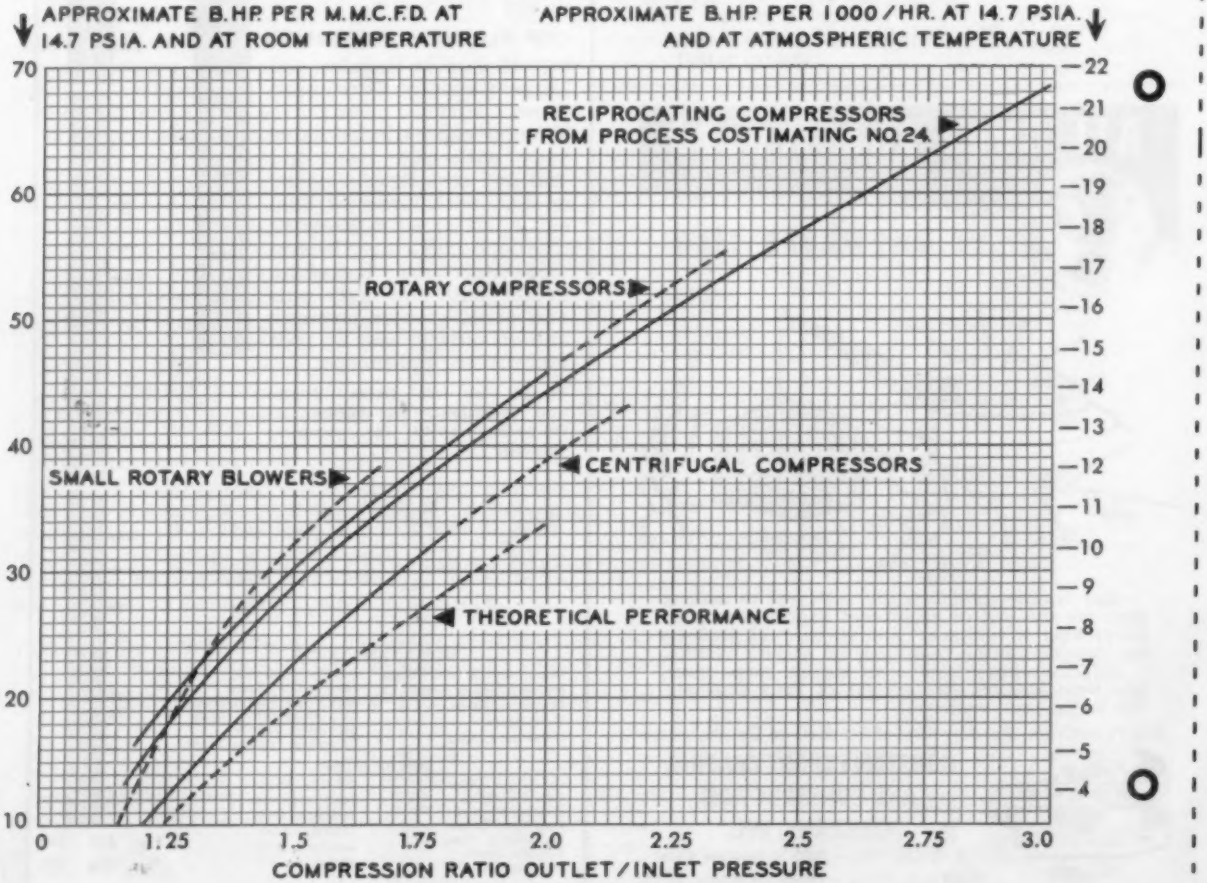
*Well price 9.8 cents (1956) in Southwest Texas. The value of refinery gases follows that of residual fuels on an FOE basis. †Estimate. ‡8.5 mills (1956). §51.2 cents per 1,000 lb. (1956). ¶$138.50 per 40-hour week (1956) including all fringe benefits, off-time, etc. ‖$1.30 per barrel (1956) including all financial charges.

PROCESS COSTIMATING RELATED TO THE COST OF POWER

No. 4—March 17, 1958, p. 190	Refinery Fuels—Heating Values
No. 6—March 31, 1958, p. 99	Fuel Costs Throughout the World
No. 14—May 26, 1958, p. 114	Cost of Electrical Power
No. 17—June 23, 1958, p. 137	The Cost and Reuse of Steam
No. 18—June 30, 1958, p. 103	Average Cost of Steam
No. 19—July 14, 1958, p. 131	By-product Electricity and Power
No. 21—July 28, 1958, p. 187	Cost of Steam for Reciprocating Pumps
No. 22—August 11, 1958, p. 123	Cost of Refinery Power
No. 23—August 18, 1958, p. 221	Efficiencies and Power Required in Estimating Pumping Costs
No. 24—August 25, 1958, p. 102	Power and Cost for Gas Compression
No. 25—September 8, 1958, p.	Air Compression—Power Required

THE APPROXIMATE brake horsepower required to compress 1,000 lb. per hour of air (or per M.M.c.f.d.) when using various types of compressors is indicated in the chart on this page. Large installations (100-500 hp.) are considered except the rotary pressure blowers that are small (5-40 hp.). The power required by exhaust fans is very low ranging from about 0.2 hp. per M.M.c.f.d. at 1-in. static water pressure on the discharge to about 2.0 hp. at a static pressure of 11 in. of water.

The cost of the power per brake horsepower is indicated in Process Costimating No. 22 (August 11, 1958, p. 123) in terms of various drives and various unit fuel or power costs.



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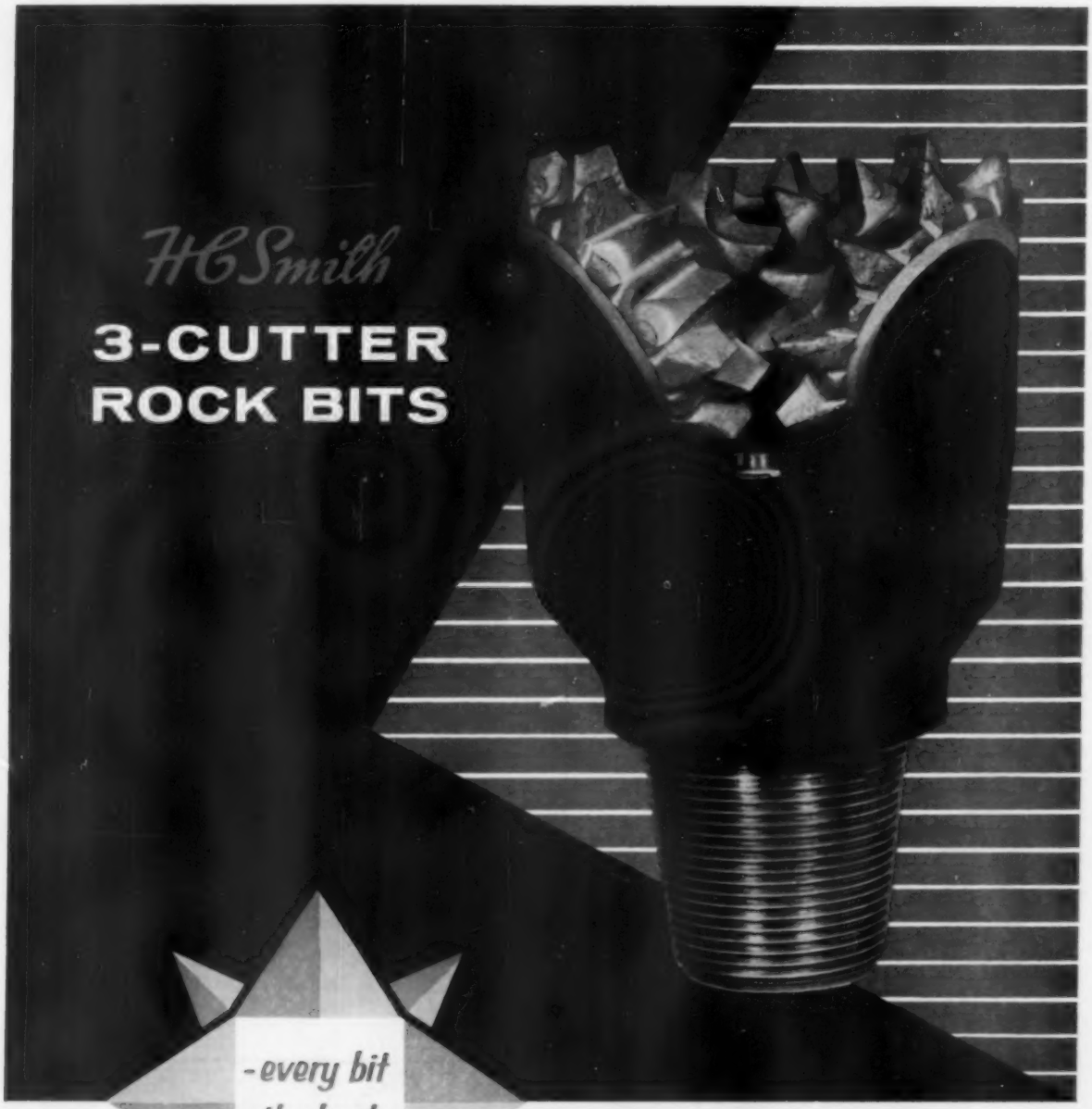

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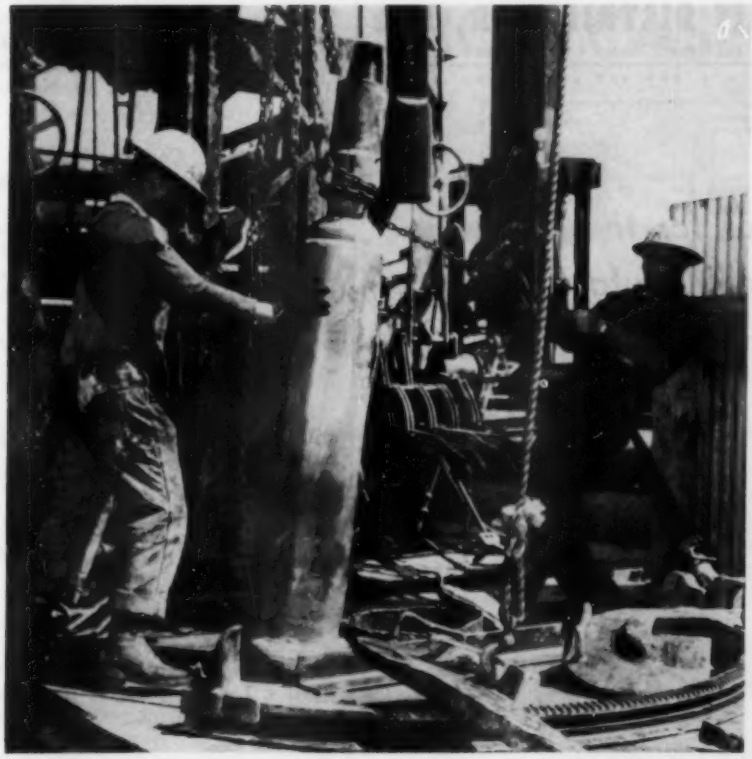

ON THE FLOOR of the cable-tool rig Acme Drilling Co., Greensburg, Pa., is using in New York State Natural Gas Corp.'s exploratory drilling operations in Lake Erie, off the coast of Pennsylvania. Shown are Gif Voorhees, right, head driller, and Bob Lucas, tool dresser, getting set to hook up a new bit. The rig is on the operating company's specially designed movable drilling platform, the Argonyn-1 (OGJ, June 2, p. 67, and Apr. 7, p. 116). The present operation (Well N-644), 6 miles east of Conneaut, Ohio, on a 19,130-acre state water-bed block near the Pennsylvania-Ohio line, is the first offshore well ever drilled on the U. S. side of the lake. It is about ¾ mile offshore in about 35 ft. of water. Plans call for drilling as deep as 6,000 ft.

Who's getting the drilling contracts

Hayden Farmer Drilling Co. is drilling on a two-well contract in Kaufman County, East Texas. The wells are for Wiggins Brothers, Inc., of Dallas, whose first operation, 1 Brazeal, in the D. H. Hughes Survey, is about 6 miles east of Kaufman. It is about 3½ miles northwest of Walter Fair field, nearest production. When this well is completed, the rig will be moved about 3 miles north for the second test, 1 Hendrixson, in the John E. Roof Survey. The latter is about 6 miles south of Elmo. Both tests will go to the Paluxy about 5,500 to 5,600 ft.

Gibson Drilling Co., Kilgore, Tex., has another contract operation going in southwestern Freestone County, East Texas. Drilling is for Purnell & Coleman, operating out of Kilgore, whose location is 2½ miles northeast of Teague in the R. P. Kelly Survey. It is on their Wood lease. Woodbine sand, expected about 4,700 ft., is the objective. Location is about 2 miles from production (from Pettet sand) in Teague field.

Globe Drilling Co., Shreveport, is on a new 5,800-ft. Woodbine job in southern Anderson County, East Texas. It is drilling for Grover J. Geiselman, of Houston. Location is at 1 Day Estate, in the Jesse Gibson Survey, about 3 miles northeast of Slocum.

Atlas Drilling Co. has contracted for another well Russell Maguire put down at Alligator Lake, in northwestern Beauregard Parish, southwestern Louisiana. Location (2 Crawford) is 2,200 ft. southeast of Maguire's discovery well, a 10,680-ft. oil pro-

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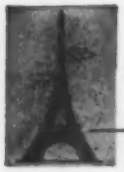

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XL Steel Pipe Couplings for OIL COUNTRY TUBULAR PRODUCTS.

ducer, which Atlas drilled early this year. The discovery well (1 Crawford), completed in February, was drilled to 12,056 ft., to which depth the second test is projected. Location is just across Sabine River (state line) from Texas' Bon Weir field, in Newton County.

Iran Drilling Co. has taken on a 5,000-ft. drilling job in southern Upshur County, East Texas. Skeeters & Curry, Longview, Tex., are the operators. Location, at 1 Perdue, in the Henry A. Augustine Survey, is about 3 miles northwest of Gladewater. The proposed depth should take the hole through the Woodbine, possibly the Georgetown.

Jordan Drilling Co., Houston, is to drill a 4,900-ft. Woodbine wildcat about 5 miles east of Fairfield, in Freestone County, East Texas. It is a contract job for Jack L. Phillips, of Gladewater, Tex. Location is for 1 Richardson-Henry Unit, in the Korn Survey.

Gulf Drilling & Well Service Co. is contractor on a 6,000-ft. wildcat Southwest Enterprises, of Lake Charles, La., is starting in southwestern Calcasieu Parish, southwest Louisiana. Location, at 1 Green, in 35-10s-13w, is about 4½ miles southwest of Vinton, and about 1½ miles from the Texas line. It is about 4 miles west of production on the old Vinton salt dome, and about the same distance northeast of the two-state Phoenix Lake field.

Southeastern Drilling Co., Dallas, has the contract on the ultra-deep wildcat Continental Oil Co. and Monsanto Chemical Co. are undertaking in the Ramos area, eastern St. Mary Parish, Louisiana Gulf Coast. The new operation (1 Avoca) is about 2½ miles southwest of British-American Oil Producing Co.'s two gas-condensate wells (Ramos field), both drilled to depths below 15,000 ft. and productive from a 14,700-ft. sand. Continental and Monsanto propose to drill to 16,000 ft.

J. C. Trahan Drilling Co., Shreveport, has a new deep-drilling operation in Plaquemines Parish, Louisiana. It is a projected 12,500-ft. wildcat for the account of **Shoreline Drilling Co.,** also of Shreveport. Location is on the west bank of Mississippi River between Port Sulphur and Venice, and about 3 to 4 miles northeast of the two Lake Washington area deep oil wells, drilled by Richardson & Bass, which for a time held the world's drilling and producing depth records.

This week's SHOWCASE features . . .

Sucker-rod coupling cuts wear

. . . as much as 50%, the maker claims. Friction coefficient of the new sucker-rod coupling is reportedly only one-fourth that of hard steel. Tests show rod and tubing wear can be reduced considerably in wells with low water production and in wells with a crooked hole.

To achieve low friction on the coupling surface, molten trimetal hard-surfacing is sprayed on and the assembly fused at 1,925° F., causing the metal particles to form a molecular bond with the base metal. **Write or call: Axelson Mfg. Co., 6160 South Boyle Avenue, Los Angeles 58, for details on sucker-rod coupling.**

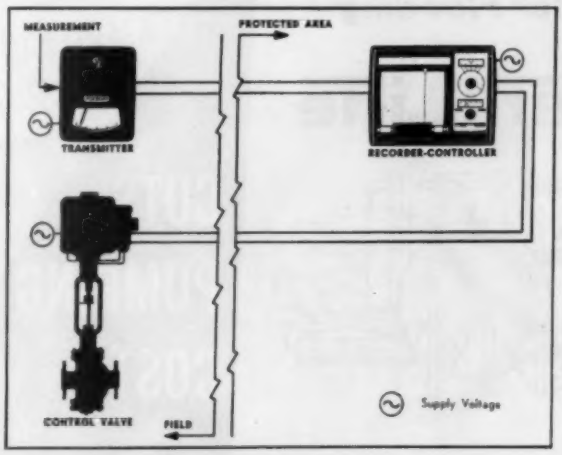
•

Bolted building is vaportight

. . . and electrically shielded to protect microwave equipment for offshore use. And the building takes hauling over rough terrain. The building cannot only be used to house microwave equipment but also as personnel housing and as housing for field compressors and other equipment that needs protection from sand and weather.

Features of the Lindsay structure include use of bolts to hold it together. All bolts are located in the framing members and none through the wall sheets.

Eye-bolts allow easy movement of the building. Available materials include stainless steel, aluminum, and copper. Spans to 16 ft. are available. **Write or call: Lindsay Structure Div., International Steel Co., 1321 Edgar Street, Evansville 7, Ind., for details on Lindsay structures.**



New electronic control system

. . . for process variables uses no vacuum tubes. Instead, it depends for operation upon magnetic amplifiers and transistors.

The new Foxboro electronic control system, designated electronic Consotrol instrumentation, includes transmitters, recorders, controllers, and valve operators to cover all functions in a process-control loop.

Two transmitter types are available—force or motion balance. Two-wire installation, narrow elevated ranges, and compact construction are features of the force-balance type. The motion-balance type gives field indication of measurement and an opportunity to incorporate alarms independent of the power supply.

Both universal and simplified controller stations are available. The universal type gives extra wide mode-adjustment ranges. The simplified type permits adjustable proportional-plus-reset action. **Write or call: Foxboro Co., Foxboro, Mass., for details on electronic Consotrol instrumentation system.**

Send this **Showcase Coupon**

to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

.....

.....

Described in OIL AND GAS JOURNAL - Issue of **September 8, 1958**

NAME.....TITLE.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

DATE.....

From Pipelines to Water Flooding

Verti-Line

CUTS PUMPING COSTS

LESS SPACE

Verti-Line pumps occupy as little as 1/5 the space of ordinary horizontal pumps of similar capacity.

GREATER EFFICIENCY

Pumping efficiencies ranging to 90% mean you get maximum output with minimum power input.

LOWER MAINTENANCE COSTS

Carefully kept records prove that for over 40 years, negligible maintenance costs are the rule with Verti-Line.

NO PRIMING

Operating overhead is cut because submerged pumping element eliminates priming.

COMPLETE LINE

Verti-Line pumps range from 20 to 35,000 gpm, 1½ to 1000 H.P., and handle both corrosive and non-corrosive fluids.
Write for Bulletin 1100

Verti-Line Pumps are exclusive products of

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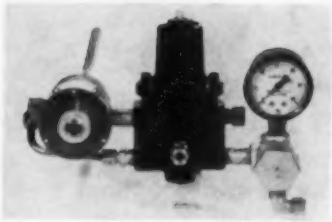

Temperature controller

. . . for three-way valves gives direct-acting throttling control. The TDA controller is available in two models—T-12-TDA with a 12-in. sensing element and T-18-TDA with an 18-in. sensing element. Both are bimetallic.

The T-12-TDA delivers 2-psi. output pressure per °F. of temperature increase within the 30-lb. supply pressure. The T-18-TDA is more sensitive under similar conditions. It delivers 3 psi. per degree of temperature increase.

A nonbleed type, the controller has a single wide range from —30° to 375° F. It's not only suited for operating three-way valves on heat exchangers, but also shutters on coolers and other diaphragm-controller applications. **Write or call: Kimray, Inc., 52 Northwest Forty - second Street, Oklahoma City 18, for details on TDA temperature controllers.**

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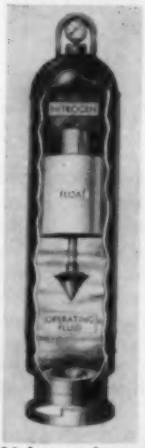
Nonseparator-type accumulator



. . . and desurger is built especially for installations where high discharge velocity is a requirement. In pump-desurger service, it softens destructive power impulses. A free-moving float is used instead of rubber bladders or diaphragms. An oversize, removable shut-off valve is used. It seats first on a rubber element and then effects a metal-to-metal secondary seal. Valve replacement is easy. Size range is 1 to 20 gal. Working pressure range is 2,000 to 6,000 psi. Any volume is available with multiple units. The maker's standard models handle such fluids as water, oil, distillate, mud, and some chemicals. Accumulators of special materials for other fluids are available. **Write or call: Payne Mfg. Co., 7317-7329 Canal Street, P. O. Box 9364, Houston, for details on new accumulator.**

performance is proof!

THE HALLIBURTON ACID FORMATION CLEANER FOR BETTER RESERVOIR EVALUATION!

Here's an actual case history:

On the first conventional test, 70 ft. of heavy oil-cut mud and 20 ft. of gas were recovered with a final closed-in-pressure of 697 psi. A Halliburton Acid Formation Cleaner was run on a repeat test and the recovery was 244 ft. of clean oil and 200 ft. of mud-cut oil, with a final closed-in-pressure of 898 psi.

When well bore damage prevents recovery of sufficient fluid for a proper well evaluation, try the Acid Formation Cleaner, another tool development by Halliburton, the unequalled Leader in Formation Testing. It provides an effective method of removing or reducing well bore damage for greater recovery—and you benefit by getting a better test!

The Acid Formation Cleaner washes potentially productive formations with fast-acting acid so that a more informative test may be taken . . . *and* with only one trip into the hole. It is especially useful in areas where formation pressure can be blocked by mud filter cake alone.

A phone call to your local Halliburton representative will bring you further information about all the advantages of the Acid Formation Cleaner. Get these facts . . . Call Halliburton!

FOR TESTING RESULTS YOU CAN TRUST

ASK FOR BULLETIN T-4015, describing the Acid Formation Cleaner and outlining additional examples of its proven performance.

ACID FORMATION CLEANER

HALLIBURTON
TESTING SERVICES

HALLIBURTON OIL WELL CEMENTING COMPANY • DUNCAN, OKLAHOMA

Oil-barge loading arms operate mechanically

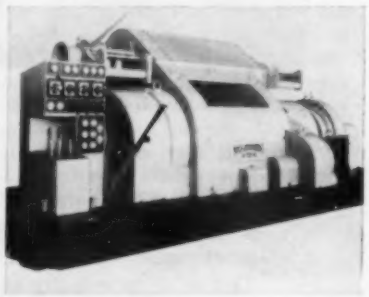
. . . to speed transfer of petroleum products. Two sizes are available—6 and 8 in. The maker reports the device can prevent most line-handling injuries, minimize dock clutter and replacement costs, speed barge loading, and eliminate hose bursts.

Materials handled include black and bright petroleum products and mild caustics. The unit safely handles products at temperatures from —60° to 225° F. at pressures to 300 psi.

Use of a gear reducer lets one man lower the counterweighted, swivel-jointed, inboard pipe section from its vertical storage position to an approximate horizontal position.

The 6-in. loading arm operates in a 20-ft. range with a 130° horizontal arc and has a 105° vertical working range. The 8-in. model has a 360° horizontal range. Its reach is 25 ft. Vertical travel exceeds 125°. Weight of the 6-in. arm is 8,500 lb. Weight of the 8-in. arm is 12,000 lb. **Write or call: Chiksan Co., Brea, Calif., for details on oil-barge loading arms.**

●



Draw works for medium depths

. . . permit fast, efficient drilling. The controls for the U-712-A draw works are incorporated in one console to increase the efficiency of the driller.

The panel is centrally located and equipped with speed-selection levers and air-actuated clutch controls. It provides complete control of the rig by the driller with little effort. Designed for drilling in the 8,000 to 12,000-ft. range, it's rated at 700 to 1,200 net input horsepower. The package unit contains a hoisting drum, transmission, rotary drive, and auxiliary brake. Weighing about 43,750 lb., it's less than 10 ft. wide and can be easily transported on the highway.

The plate-steel case is integral with the skid frame. Inspection windows, access covers, and removable floor plates allow easy servicing. At the hoisting drum, six forward and two reverse speeds are provided. Three forward speeds and one reverse speed are available to the rotary countershaft, catshaft, and sandreel. Band wrap is 315°. Total effective braking area is 2,640 sq. in. **Write or call: Mid-Continent Supply Co., Box 189, Fort Worth, for details on U-712-A draw works.**

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OIL FIELD TYPE

LONG LIFE
Heavy-Duty

POWER TAKE-OFF

Main Bearings are 40,000 hour type

Eliminates the Pilot Bearing
Release and Main Bearings are lubricated for one year
Main Bearings are 40,000 hour type
Handles 5,000 pound Belt Loads
Out-Board Bearings and Flexible Couplings eliminated
Furnished with Single or Double Plate, Organic or Morlife faced Gear tooth Type Clutches

Insure longer work life and reduce down-time with this NEW extra heavy-duty ROCKFORD POWER TAKE-OFF.

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Gives dimensions, capacity tables and complete specifications. Suggests typical applications.

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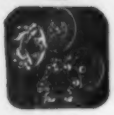

Small Spring Loaded

Heavy Duty Spring Loaded

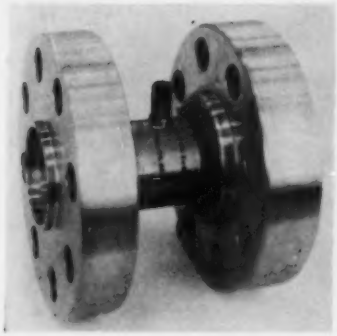
Oil or Dry Multiple Disc

Heavy Duty Over Center

Power Take-Offs

Speed Reducers

CLUTCHES



Turbine-type gas flowmeter

. . . handles any gas at any flow rate or pressure, the maker reports. A series of the turbine-type meters is now available for gas-flow measurement with an accuracy of ±0.5% of reading and a 10-to-1 flow-range spectrum from 0.03 to more than 30 M.c.f. per minute at any desired pressure.

The design and performance features of the liquid-flow Potter turbine meter are incorporated in its adaptation to gas-flow measurement.

The meter transmits information by generating a pulse with a frequency directly proportional to the flow rate. **Write or call: Pottermeter Co., Union, N. J., for details on new flowmeter.**

●

New tree is compact

. . . and takes up only one-fifth of the space needed for a conventional tree of the same pressure rating. Components include a single-string, solid-block tree valve with swabbing valve, choke, flow-line valve, gin-pole socket, and small threaded outlets for pressure-control equipment and sampling.

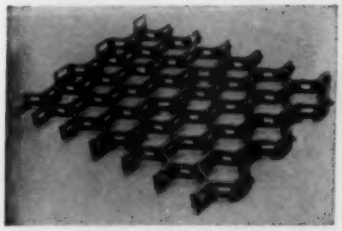
The tree design makes it possible for the flow line to parallel the casing down to a depth in a lake which will give ample ship clearance and an added safety feature. **Write or call: Cameron Iron Works, Inc., 1000 Silber Road, Houston, for details on tree valve.**

Steel-mesh armor reduces damage

. . . by erosion and abrasion to the castable lining of vessel walls. Called Gridsteel, it is attached to the shells of such vessels as cat crackers, hydroformers, reactors, regenerators, and cyclones. It provides an interior surface of hexagonal steel cells.

The steel mesh supports the castable material and prevents slump. It provides a framework which overcomes the tendency for the lining to crack, blister, pit, or collapse under internal pressures, temperature changes, and catalytic bombardment.

It's made of steel bars on edge, bent, and clinched together to form a pattern of cellular hexagons. A keyway slot in each side of the hexagons permits passage of castable material between adjacent cells. **Write or call: Irving Subway Grating Co., Inc., 5036 Twenty-seventh Street, Long Island City 1, N. Y., for details on Gridsteel.**



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All-New

Rotary-Balanced

JACK

. . . oilmen say this new RB model is a superb example of modern, functional engineering design.

Fast, low-cost installation because it mounts on simple steel skid or flat concrete surface.

Its unique rack-and-pinion system enables one man standing on the ground to make counterweight adjustments easily, quickly and safely.

The New JENSEN RB brings profits up, keeps costs down. Get the facts on this all-new RB unit, as well as Jensen's famous beam balanced line of jacks.

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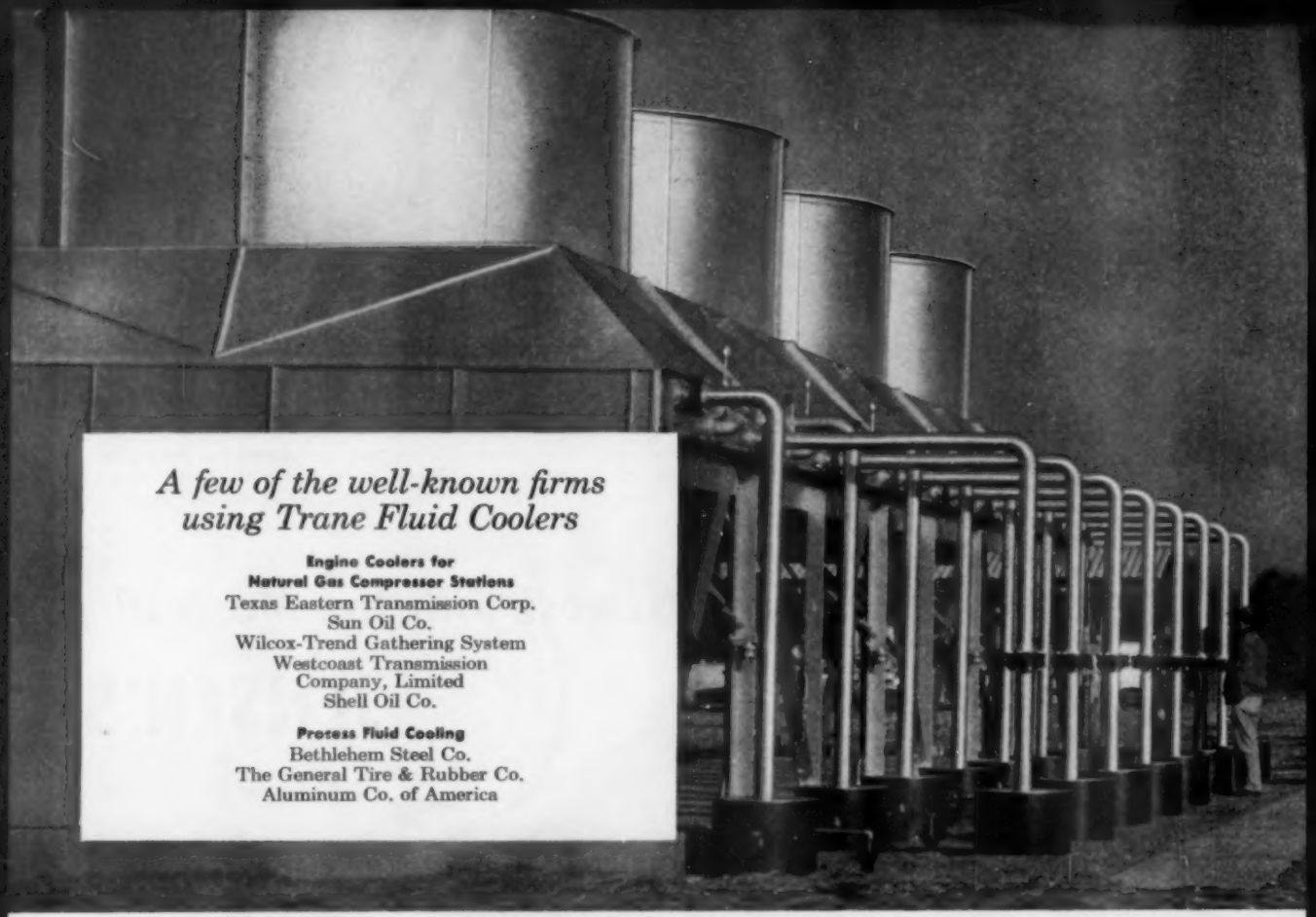
JENSEN JACKS



A few of the well-known firms using Trane Fluid Coolers

Engine Coolers for Natural Gas Compressor Stations

Texas Eastern Transmission Corp.
Sun Oil Co.
Wilcox-Trend Gathering System
Westcoast Transmission Company, Limited
Shell Oil Co.

Process Fluid Cooling

Bethlehem Steel Co.
The General Tire & Rubber Co.
Aluminum Co. of America

At this Tennessee Gas Transmission station in Clymer, New York, four TRANE

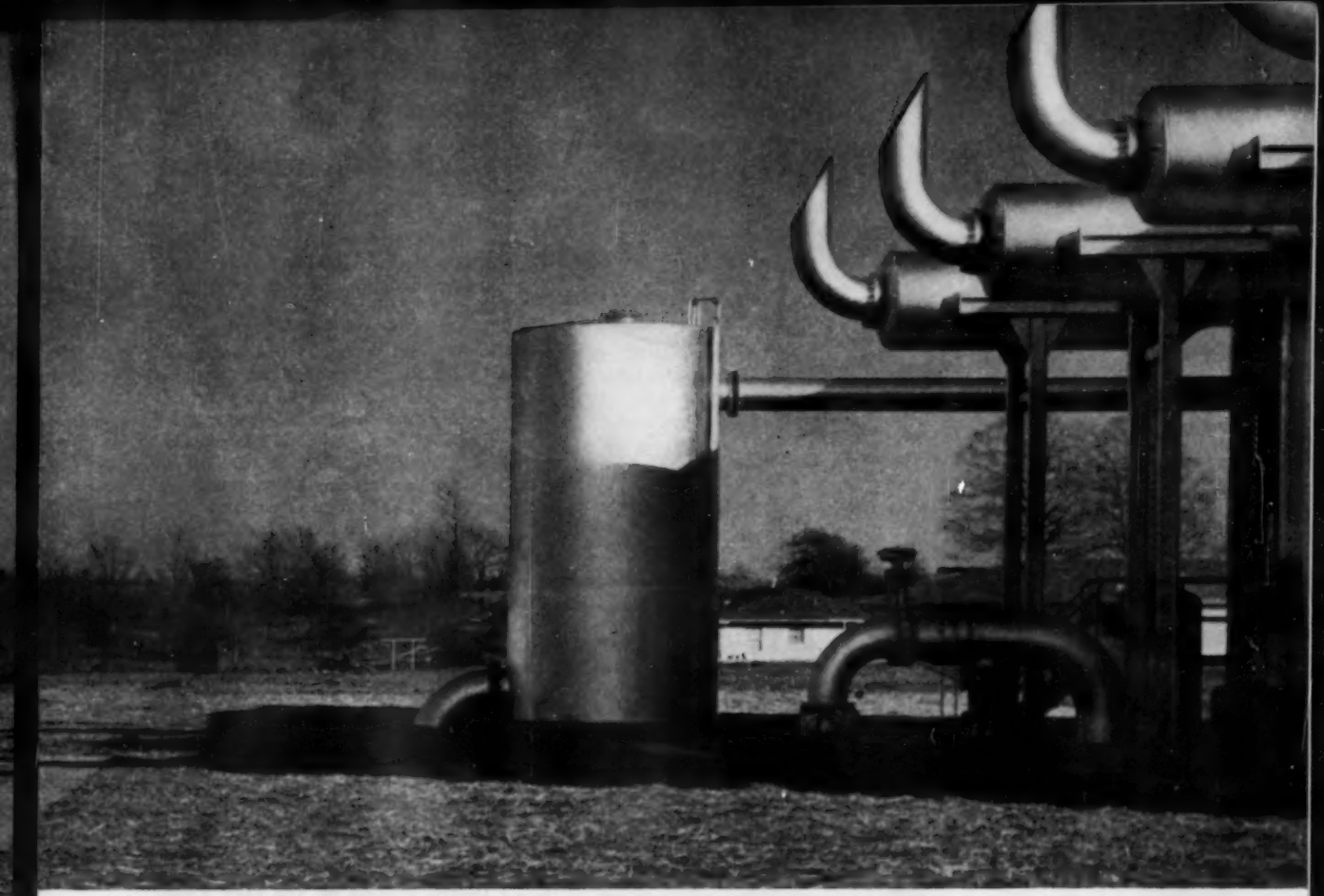
Tennessee Gas installs Trane

Induced draft units erected, tested and run-in at Trane laboratory before shipment

At Tennessee Gas Transmission Company's Clymer, New York station, four induced draft TRANE Fluid Coolers were installed to cool jacket water for four 2000 hp gas engine compressors. Before these units were shipped, they were erected and tested in the TRANE laboratories. Here, engineers were able to check all aspects of a prototype unit's performance—freedom from vibration, uniformity of air distribution through the heat transfer section, and every detail of workmanship and construction.

More and more major pipeline transmission companies are turning to TRANE for their fluid cooling equipment. Many have reported that TRANE Fluid Coolers are rugged, dependable, simply designed—with a minimum of maintenance and adjustment problems. And, with TRANE Fluid Coolers, engineers know that they can depend upon the accuracy and completeness of the capacity ratings. These ratings are based upon the industry's most complete laboratory testing—plus many years of field experience. Unlike many manufacturers, TRANE makes all its own coils—has had thirty years of experience in this highly specialized field.

When you have a fluid cooling problem, turn to TRANE! Call your nearby TRANE Sales Office, or write TRANE, La Crosse, Wisconsin.

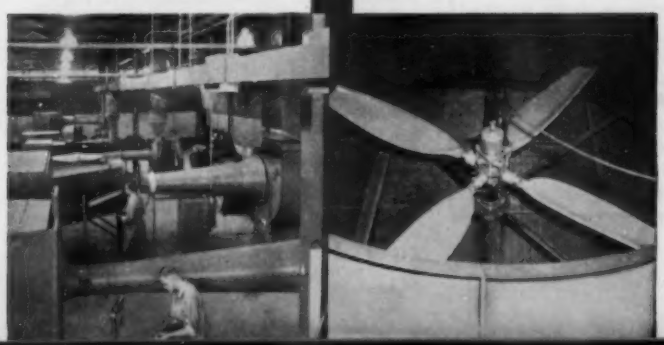


Fluid Coolers are used to cool jacket water for four 2000 hp gas engine compressors.

Transmission Co. Fluid Coolers

Wind tunnel room in TRANE laboratory—"The House of Weather Magic"—where as many as ninety different temperature readings are taken across the face of a heat transfer section. In this laboratory, complete testing facilities are available to provide the data for rating the performance of every piece of equipment. Here, too, new TRANE products are developed and tested.

Controllable pitch propeller assemblies were supplied for this installation. Automatically hold fluid outlet temperatures to plus or minus 2°. Have fewer moving parts, bearings, controls . . . cut power costs as much as 50%. Fan, motor and drive are factory-aligned on a single metal base to cut installation time. All framework parts are pre-drilled and match-marked.



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MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

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won't rust, chip
or peel

There's no paint on Lufkin Chrome Clad "Atlas" Oil Gaging tape lines.

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It's 50% heavier *than standard-weight steel tapes. Shows oil level clearly. Wipes clean easily. In lengths from 18 to 100 feet.*

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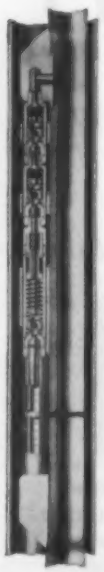

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TIME TESTED
MACCO
GAS LIFT

BOTTOM HOLE CHEMICAL INJECTION VALVE
MACCO "Outside Mounted" Chemical Injection Valve Assembly

This valve affords an effective and proved method of inhibiting corrosion **by adding exactly controlled amounts of chemical inhibitors into the tubing . . .** without losses, regardless of pressure conditions or pressure variations inside the tubing. This is accomplished by pumping the inhibitor into the annulus (filled with 40 parts carrier fluid to 1 part inhibitor, for example) and forcing it through the chemical-injection valve set above a packer. Since this system is hydraulic, the quantity entering the tubing will be the same as the quantity pumped into the annulus at the surface. Thus, varying pressure conditions inside the tubing do not affect the amount of inhibitor injected. This method provides protection for three surfaces in one operation—the inside and outside of tubing plus the inside of the casing. (This process is fully patented by Macco Oil Tool Company, Inc.)

Write for additional literature or information.

MACCO OIL TOOL COMPANY, INC.
Phone UN 1-1253
1521 Prince **P. O. Box 7288** **Houston 8, Texas**

SHOWCASE . . .

New Literature

Multiple-seal gate valve

. . . that's said to be nonconducting, nonabsorbent, lightweight, and strong, is described in a new technical data sheet. The Type FSL straight-safety ladder has high-tensile-strength aluminum rungs. This combination makes it safe for use around high voltage and chemicals, the maker says. It takes a minimum of 75,000 volts to flash an arc between two parallel rungs and 150,000 volts to flash an arc between alternating rungs. **Write or call: Aluminum Ladder Co., Worthington, Pa., for Safety Ladder bulletin.**

Glass-fiber safety ladder

. . . treatment is designed to permit visual inspection of all parts. It's described in a new technical data sheet. The erosion of metal has been minimized by the use of larger fluid passages and by the use of steel of greater thicknesses, strength, and proper hardness. Machined union-connections are used in the threaded and welded nipples. Check valves are built into the header to prevent back flow if treating lines fail. **Write or call: Dowell division of The Dow Chemical Co., P. O. Box 536, Tulsa 1, for Frac Header bulletin.**

Header for well-fracturing

. . . is a new leakproof type for aromatics, hydrocarbons, and LPG that's described in new four-page Bulletin GV-30. The valve features two metal-to-metal seats and two secondary O-ring seals. Dimensions and engineering data are included as well as examples of installations. Included is a diagram that shows how to change O-rings. **Write or call: Vernon Tool Co., Ltd., 1101 Meridian Avenue, Alhambra, Calif., for Bulletin GV-30.**

How to heat gases

. . . vapors, and liquids efficiently with Brown Fintube Type 102 heaters is the subject of a new eight-page brochure. The improved heater successfully answers a wide range of exacting heating problems in refineries and petrochemical plants, according to the maker. These include heating of asphalt and Bunker C oil, and chemical heating requirements that demand accurate temperature control. They also include heating gases or liquids above range of temperatures economically heated with steam or where no steam supply is available, the heating of transfer oils, and other fluids. The

bulletin serves as a convenient guide to aid prospective users to analyze the possible advantages of indirect-fired heaters. **Write or call: Brown Fintube Co., Elyria, Ohio, for Bulletin 587.**

Digital telemetering system

. . . is detailed in a new four-page Catalog EA7A. The bulletin fully describes both electrical and mechanical counters and information storage units. The scanner-transmitter, receiver, and digital readout of the Model TM-16 units are also described. **Write or call: Control Corp., 718 Central Avenue, Minneapolis 14, Minn., for Bulletin EA7A.**

Liquid-level control

. . . which operates without floats and with no moving parts in the liquid is described in new 16-page catalog. It includes liquid-level relays, electrodes, signals, alarms, and alternators, with descriptions, charts, and diagrams of typical applications. **Write or call: B/W Controller Corp., 2200 East Maple Road, Birmingham, Mich., for Liquid-Level Control Catalog.**

Centrifugal pumps for refinery

. . . and process service are described and illustrated in new six-page Circular 201. Called Series R-200, the new line meets API and major-oil-company specifications together with maximum interchangeability of parts, the bulletin says. Capacities range from 25 to 1,000 g.p.m. with total heads to 65° ft. in a pumping temperature range from —150° to + 850° F. **Write or call: Dean Brothers Pumps, Inc., 323 West Tenth Street, Indianapolis 7, for Circular 201.**

Catalytic sweetening process

. . . is described in a new four-page brochure. Besides explaining how the process works, the bulletin gives useful application information drawn from actual operational data in existing plants. It also covers chemical requirements as well as treating costs. Flow diagrams and installation photos are included. **Write or call: Petreco, Div. of Petrolite Corp., 369 Marshal Avenue, St. Louis 19, for Petreco-Bender bulletin.**

How to strip paint

. . . is the title of new eight-page Booklet F7893. Four methods commonly used to remove paint are described in detail. These include hot-flow-on method, tank immersion, steam-gun method, and brushing. Twelve different paint-stripping compounds, alkaline, solvent, and solvent-acid, are described. The booklet also discusses the treatment of metals before repainting and prevention of rust on stripped surfaces in storage. **Write or call: Oakite Products, Inc., 19 Rector Street, New York 6, for Booklet F7893.**

Fired heaters Bulletin A-46

. . . shows principal design features of standard types and special-design fired heaters. It includes drawings and description on special fired heaters for severe services. It also features photos of typical installations in plants of most of the important petroleum and chemical companies. **Write or call: Struthers Wells Corp., Warren, Pa., for Bulletin A-46.**

Bent-tube boilers

. . . are detailed in new 22-page Bulletin VF-VS 2. Detailed diagrams show various boiler installations in refineries and petrochemical plants. Two basic designs are shown. Class VF units provide maximum capacity where floor space and head room are limited. Class VS units can be used where there are no room restrictions. **Write or call: Henry Vogt Machine Co., Inc., Box 1918, Louisville, Ky., for Bulletin VF-VS 2.**

Tank lining for sour crude

. . . aromatic solvents, high-octane gasoline, and chlorinated solvents is described in new four-page Bulletin 258. The air-dry protective coating, called Plasite 7111, is applied in a film thickness of 8 to 10 mils, requiring only two spray coats. The heavy film-build properties simplify application procedure under unfavorable conditions. This coating and other high-resistant coatings for the petroleum and natural gas industry are detailed in the bulletin. **Write or call: Wisconsin Protective Coating Co., P. O. Box 243, Green Bay, Wis., for Bulletin 258.**

ALUMINUM MAP CARRYING CASE

to carry or mail confidential rolled maps, prints, plans, etc. Made of 16 ga. aluminum alloy with "comfort grip" and steel hasp for lock. 36", 42" and 60" lengths — other lengths made to order.

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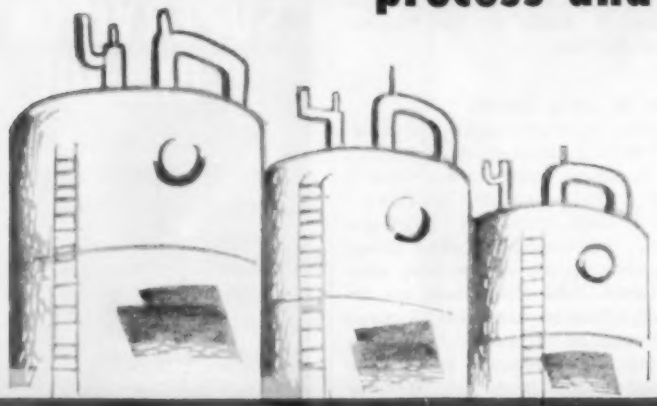
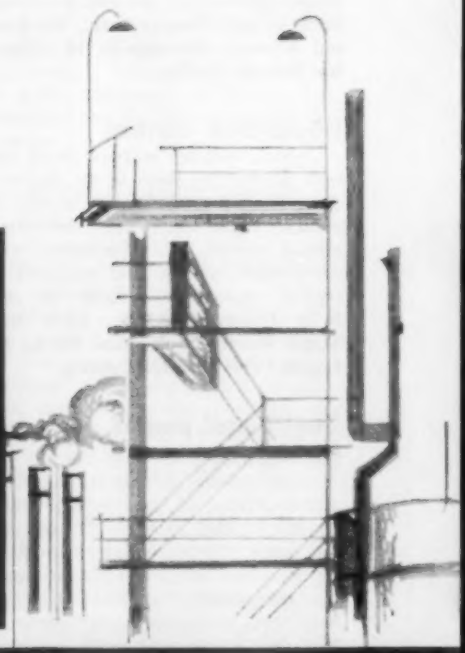
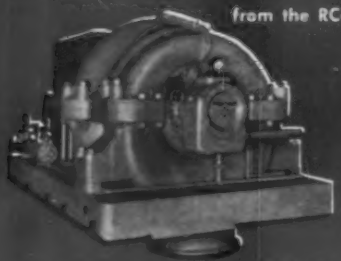
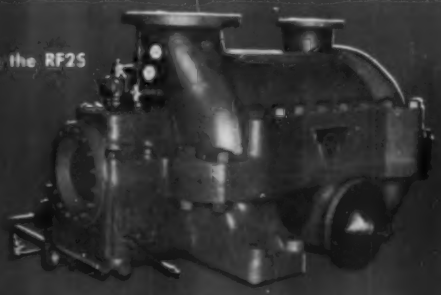




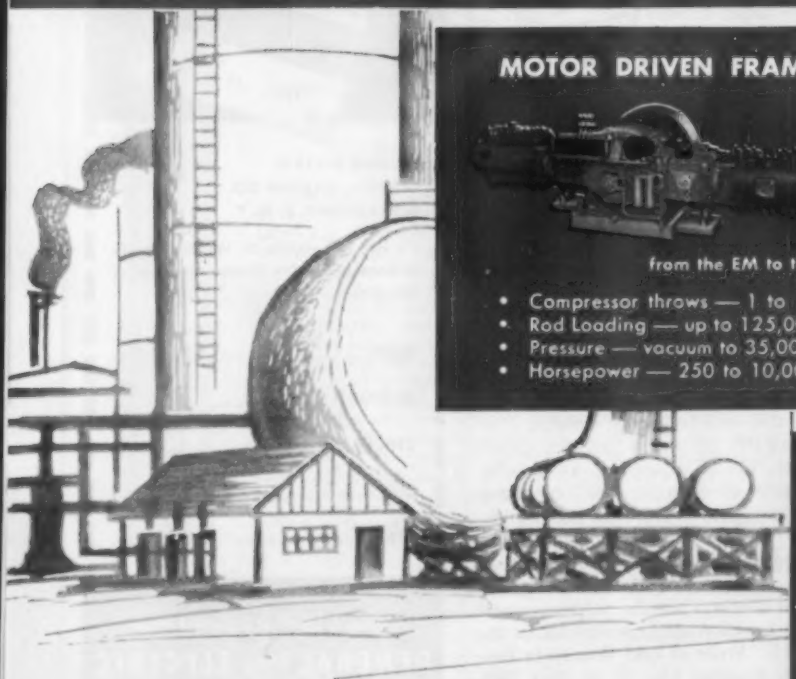
CENTRIFUGALS

from the RC65 to the RF25

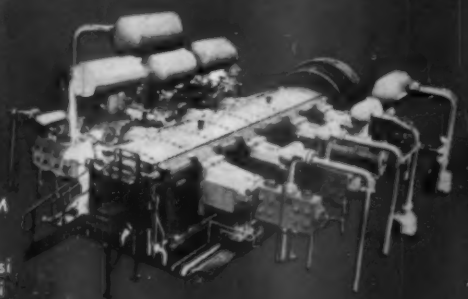




- Pressure — vacuum to 5000 psi
- Horsepower — 1000 to 15,000 hp



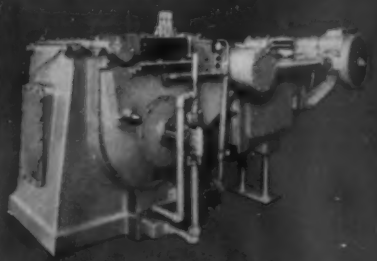
MOTOR DRIVEN FRAMES



from the EM to the LM

- Compressor throws — 1 to 10
- Rod Loading — up to 125,000 psi
- Pressure — vacuum to 35,000 psi
- Horsepower — 250 to 10,000 hp

EXPANDER UNITS



from the JX to the FX

- Pressure — to 3000 psi

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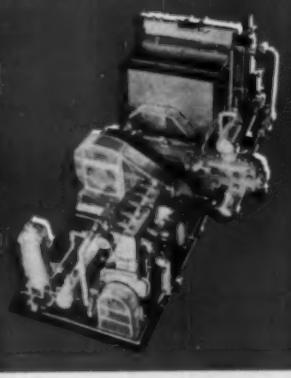
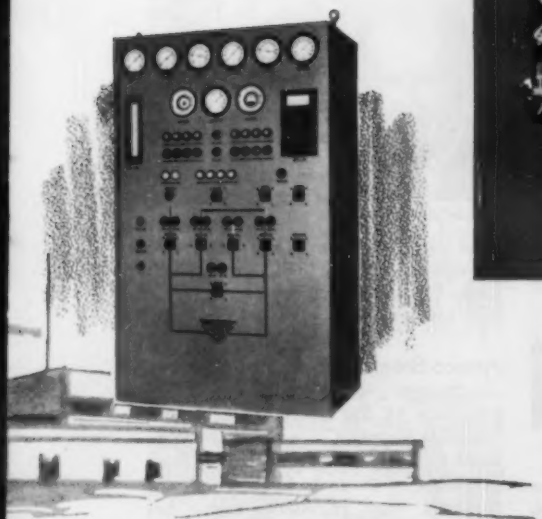
ENGINE DRIVEN FRAMES

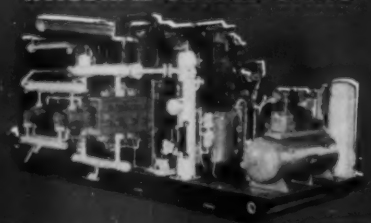


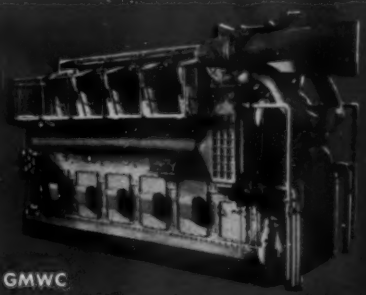
from the FMP to the LSV-driven JM

- Compressor throws — 1 to 10
- Rod loading — up to 125,000 psi
- Pressure — vacuum to 35,000 psi
- Horsepower — 500 to 5000 hp



INTEGRAL ANGLE UNITS





from the GMXD to the GMWC

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- Horsepower — 265 to 3500 hp

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EQUIPMENT MEN

IN THE NEWS

Charles T. Hapgood purchases

C. T. Hapgood

. . . Petroleum Pipe & Supply Co. He assumes the presidency of the firm that has been a distributor of pipe, valves, fittings, and heating supplies for the past 12 years. The former owner, A. W. Schillinger, will continue with the firm as vice president. Hapgood was formerly with J&L Steel Corp. for 25 years and has also served with Republic Steel Corp.

Gray Tool Co. appoints

. . . Ball & Black Supply Co. as California representative for Gray's full line of oil-field equipment. This appointment is the result of a plan to provide faster and more extensive sales and service to customers in that area, according to E. F. Hill, Gray Tool president.

J&L Supply Division announces

. . . changes in the field sales organization, according to W. L. Wolfe, vice president, sales. W. C. Blackledge, store manager at Laurel, Miss., is assigned as salesman at Laurel. H. E. Reeves, sales trainee, is appointed salesman at Brookhaven, Miss. G. R. Cain, storeman at Hobbs, N. M., is promoted to salesman at Kermit, Tex. D. R. Williams, salesman, at Snyder, Tex., transfers to Tulsa in the same capacity. P. V. Ray, salesman at Alice, Tex., shifts to Pleasanton, Tex.

Ralph J. Dicus appointed

R. J. Dicus

. . . as district sales manager, North Texas and Oklahoma area, for Cardwell Manufacturing Co., according to Clyde Lackey, domestic sales manager. Dicus formerly served with Wilson Manufacturing. In his new capacity, he will maintain an office in Cardwell's Oklahoma City store.

Ray Webb assumes new position

Ray Webb

. . . as vice president and general manager of Inferno Manufacturing Corp., Shreveport, La., according to A. G. Blanchard, president. Webb, formerly advertising manager, will continue in that capacity and also assume additional engineering duties. Prior to joining Inferno, he was employed with an advertising agency.

Cooper-Bessemer Corp. acquires

. . . Creole Engineering, Inc., Houston, as a new wholly-owned manufacturing and engineering subsidiary, reports E. L. Miller, president and general manager of Cooper-Bessemer. The entire Houston operation is headed by T. E. Kraner as president. He was formerly district manager of Cooper-Bessemer's Caracas, Ven., office and more recently of the New Orleans office. Initial engineering and construction at the new subsidiary will concentrate on the completely packaged, prepiped gas engine compressors such as the GMXD gas gathering units.

Two changes in sales announced

. . . by American Iron & Machine Works Co., Inc., according to Bert Wheeler, sales manager. Fern Wagner and Joe Thompson have been appointed assistant sales managers. Wagner, who has been with American Iron 23 years, will be in charge of personnel, sales training, work methods, and new distribution outlets. Thompson, who has worked in sales for the company in Kansas, Colorado, Canada, and Texas will be responsible for new products training and promotion, special products promotion and advertising to sales department, and the field testing of new products.

Fern Wagner

Joe Thompson

Frost Engineering Service Co. appointed distributor

. . . in southern California for F. H. Maloney Co. pipeline specialty products, according to J. H. McBrien, vice president and general sales manager of Maloney. Frost is headed by Vern Frost, with John Merrill, as general manager, and Jack Crawley, as office engineer-manager. Shown signing the distribution agreement are, seated: McBrien, Frost, and R. W. Maloney, western division manager for Maloney. Standing are: Merrill and Crawley.

Republic Supply Co. opens

Rudolph Crowley

. . . a new store at Tioga, N. D., with Rudolph Crowley as store manager and P. L. Williams as assistant store manager. Crowley was formerly store manager at Fairfield, Ill., and Williams was formerly head floorman there. The new store manager at the Fairfield store is T. R. Link, formerly sales representative at that location.

Armco Steel Corp. announces

. . . changes in organization made necessary by the recent mergers with National Supply Co. and Union Wire Rope Corp., according to R. L. Gray, president of Armco. L. T. Johnston, formerly vice president, sales, has been elected executive vice president. W. B. Quail, formerly general manager of Armco division sales, and W. S.

Newell, formerly general manager of Sheffield division sales, have been elected vice presidents in charge of steel sales in their respective divisions. E. H. Thorsteinson, formerly vice president and controller of National Supply, has been named assistant to the president. G. R. Graham, formerly assistant controller of National Supply, has been elected controller of that company.

Kane Boiler Works, Inc., opens

L. D. Frazee

. . . a new sales office in the Bank of the Southwest Building, Houston, according to Joseph J. Kane, president. L. D. Frazee, recently named vice president, will share responsibility of the Houston office with G. W. Campbell, sales manager. The company has just completed an expansion program that includes a new mill designed to manufacture high-test Kaneweld (5LX) line pipe. G. L. Davis, with Kane since 1922, is production superintendent and Earl Moore is chief engineer of the Galveston operations.

Promotions, transfers made

. . . by Schlumberger Well Surveying Corp. B. W. Alley is now sales engineer at Gretna, La., and T. W. Cobb has been named sales engineer in New Orleans. The former manager at Big Lake, Tex., J. C. Givens, has transferred to Hobbs, N. M., as district manager. J. L. Reinders, formerly field engineer at Artesia, N. M., has been promoted to district manager at Big Lake. G. H. Thomen has shifted from Corpus Christi, Tex., to New Orleans as assistant to the area manager. He was location manager in Corpus Christi.

Joe W. Bull transfers

. . . to Houston to fill the position of city salesman of Milwhite Mud Sales Co., a subsidiary of the Mississippi River Fuel Corp., reports George Conner, executive vice president. Bull has been with Milwhite for the past 5 years as an engineer in West Texas and city salesman in Dallas and Fort Worth.

Continental-Emsco Co. names

. . . Dan H. Moore as store manager at the El Dorado, Kans., store. R. J. Grigsby, former field salesman, has been appointed D+B specialist to be stationed at New Harmony, Ind. W. M. Havard will be D+B specialist at Laurel, Miss.

Manuel and Wallace transfer

Tom Manuel

. . . to Christensen Diamond Products Co.'s affiliate company, Christensen Diamond Products Co. (France). Tom Manuel, formerly Salt Lake City, Utah, district manager, will be located in Celle, Germany. He will work through a subsidiary company, Christensen Diamond Products GmbH. Hugh Wallace, formerly of the Oklahoma City district, will be stationed in Rome. He will work with special foreign sales representatives in the servicing of customers throughout Italy, the Near East, and Africa.

J. B. Beaird Co., Inc., opens

R. W. Rademacher

. . . a district office in New York City to serve more closely the eastern market, according to J. Pat Beaird, president. R. W. Rademacher, formerly manager of plant storage, has been promoted to manager of the eastern division and will be in charge of the New York office. He has been with the company since 1952. Before joining Beaird, he was with United Petroleum Gas Co. and Skelly Oil Co. In his new capacity, he will work under the direction of W. W. Sentell, manager, general products division.

Panellit, Inc., names

. . . Joseph E. Kleuger, former assistant chief engineer, as regional sales manager for Texas, Louisiana, Oklahoma, Arkansas, and parts of New Mexico and Kansas. From his new headquarters in Houston, he will supervise a force of 20 agents who will sell the firm's annunciators, control panels, data loggers, and related products in the automation and control field.

McJunkin Corp. opens

. . . a new branch warehouse in Houston with Larry E. Battin, who has been Southwest district manager, as manager of the branch. Mack O. Roberts will be in charge of oil country sales. McJunkin has purchased the inventory of Buffalo Industrial Supply Co. and has leased the warehouse and yard storage facilities formerly occupied by Buffalo. Personnel from Buffalo will join the McJunkin organization.

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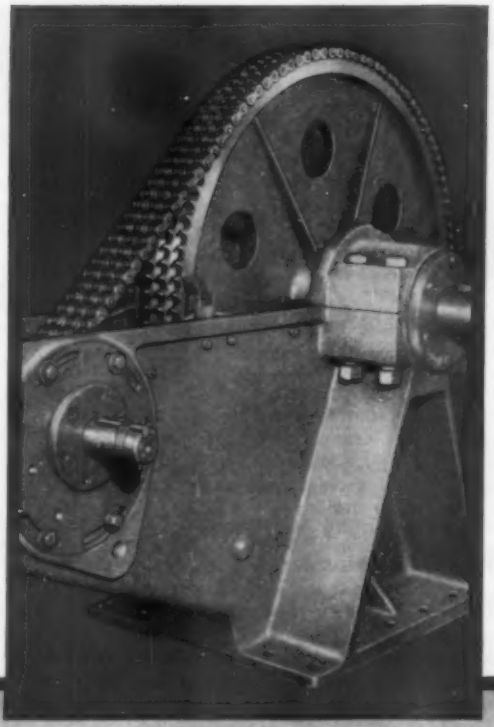

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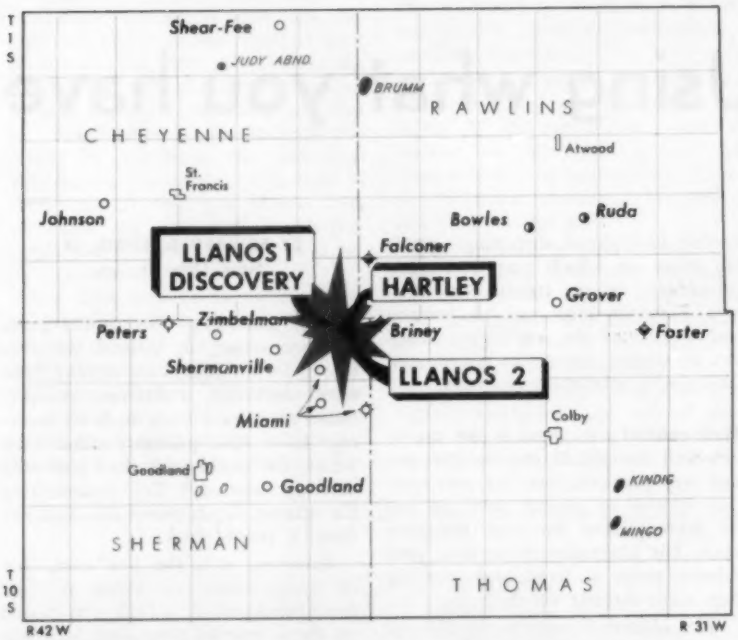

NORTHWEST KANSAS' "Little Four Corners" is really busy today as 11 wildcats search for Pennsylvanian pay. Two new extensions to the Phillips 1 Llanos discovery, plus showings at two remote wildcats in Rawlins County, have built a fire under the play.

Northwest Kansas play shapes up

BY FRANK J. GARDNER

IF YOU DOUBT that one remote wildcat discovery can plunge a whole region into a drilling spree, just take a look at this map.

When Phillips Petroleum Co. completed its 1 Llanos in northeastern Sherman County, last May, the strike was widely heralded as the beginning of a new era in Kansas exploration.

Today we see 11 wildcats whirling away in the northwest corner of the Sunflower State. This play centers on the "Little Four Corners" at the junction of Cheyenne, Rawlins, Thomas, and Sherman counties. Here Phillips has two indicated commercial offsets to the 1 Llanos. One of these, the 1 Hartley-A, in Section 3-6s-37w, has been officially completed in the Marmaton-Pennsylvanian for 345 bbl. per day with production coming from perforations at 4,585-88, 4,633-40, and 4,664-70 ft. Phillips will try to dually complete this one in the Lansing-Kansas City section where swabbing perforations at 4,504-09, 4,439-51, and 4,425-30 ft. recovered 15 bbl. of oil per hour. This is a northeast extension to the new field.

The second indicated offset success lies southeast of the discovery well in Section 10-6s-37w. This is the 2 Llanos. Here the operator swabbed oil at a rate of 16 bbl. an hour from Marmaton at 4,674-83, 4,611-15, and 4,620-24 ft., with top of the Marmaton logged at 4,558 ft.

It will be remembered that the original discovery at Phillips 1 Llanos rated a potential of 319 bbl. per day of 23°-gravity oil with the pay zone in the Cherokee at 4,804-12 ft.; official completion date was June 3, 1958.

The two new wells, then, add a second and shallower pay zone to the field, and if success is met in the Lansing-Kansas City, we will have a good new three-pay pool on our hands.

Another new development that could really set off a major search here is the recovery of good oil showings at two Rawlins County wildcats —the Jackson, Shear & Parker 1 Ruda in Section 14-4s-33w, and the same operators' 1 Bowles in Section 24-4s-34w. These two indicators hint of more fields to come in this county, even though one, the 1 Ruda, had to be given up because of mechanical problems.

The 1 Ruda, with total depth 4,680 ft. in the Arbuckle-Ordovician, recovered oil on a drill-stem test of the Lansing-Kansas City between 3,919 and 4,150 ft. But the operators have had a bit of fishing trouble. They perforated the Marmaton at 4,312-15 ft., squeezed after a slight show, and have now abandoned.

At the Bowles wildcat, Jackson, Shear & Parker have had a bit better luck. They recovered 468 ft. of clean, high-gravity oil on a 1-hour drill-stem test of the lower Marmaton at 4,419-43 ft. Top of the Marmaton here is 4,281 ft. and Cherokee 4,441 ft. Pipe was set at 4,550 ft., and it looks as if an important new discovery may occur here.

Some Good, Some Bad

All is not rose colored in this new theater. There have been five dusters recorded in the past few weeks as shown on the map: two in Thomas County, two in Sherman County, and one in Rawlins. The encouraging thing, however, is that two of the dry holes at least had shows of oil. And the encouragement at the Bowles and Ruda wells lends luster to the play.

There is some evidence of structure in this region, but it is rather slim. Most geologists agree that this will turn out to be strat-trap country as the Pennsylvanian sands come and go in this northern shelf of the Hugoton embayment.

This campaign was long overdue. Some small discoveries had been made at Judy in Cheyenne County (now abandoned); at Brumm in Rawlins County (a Lansing-Kansas City find), and at Kindig and Mingo fields in Thomas County (Cherokee and Marmaton producers). It took the Llanos discovery to really jolt Kansas operators into an awareness of the possibilities here. And if things keep going as they are now, we may be in for some **real** jolts in the next few months.

The fourth dimension in exploration:

Using what you have

BY EDWARD A. KRIEG, JR.
New Orleans, La.

EXACTLY WHERE are the areas you have covered by seismograph in the last 20 years?

They are probably filed away under prospect or area name or number. Final reports, complete with maps are within easy reach; the basic data are carefully labeled and stored for future reference.

But do you have a base or regional map showing all this coverage at a glance? Is there a copy of it in each district and division office available to your geologist? And do your geologists use these data?

A "no" answer to any one question could form the basis for an expensive error of commission or omission. If you have a geophysicist or geophysical department it should be his or its responsibility to disseminate all accumulated geophysical information, (seismic, gravity, and magnetic), that might be of use to each office, or to each geologist. With no regular geophysical staff to assist, the responsibility should then rest with the geologist in charge of each area.

As exploration costs increase and surface development inhibits and restricts current activities, the older data may be enhanced in value. Because it is felt there is room for improvement in the use of data already at hand, a few suggestions are offered toward that end.

After all, not every discovery is based on very recent, hot-off-the-tape, magnetic recording.

Using What You Have

The most important first step is to have a base map showing the various surveys by outline. Additional information, date of survey, number of shot points, indication of quality, and depths mapped may be added if desired. A different legend can be used to indicate areas you have reviewed from farmout studies. Gravity and magnetic coverage may be confined to locations of anomalies identified by suitable symbols.

Strip maps . . . A further refinement in keeping track of your past investments is to transcribe the seismic contouring to regional strip maps, possibly those on which you have your subsurface, or on transparent overlays. Pick the most suitable horizon and make sure the contouring stands out as seismic control to avoid confusion with subsurface contours.

Well control . . . Next is the use of new-well control. If you use the second step just described the well spotting relative to seismic coverage will be accomplished by your draughtsman. The alternative is to have your seismic maps at hand and spot the new wells directly on them.

The objective and the results will now be obvious: There are disagreements between the seismic and subsurface interpretations. Faults must be added or eliminated; rates and directions of dips may have to be compromised. Your recent subsurface control may be deeper than your old seismic map and may indicate that a fresh, (or original), try at interpretation of deep data is in order. (There were very few seismic maps constructed below 12,000 ft. during prewar shooting).

In some cases you may find your subsurface information confirming the original seismic work. Frequently a seismic horizon mapped will not be near the depths of the regional markers carried on your strip maps. Usually it is an easy job to check the electric logs for intermediate picks which will closely approximate the seismic depths.

EDWARD A. KRIEG, JR., is a consulting geophysicist, New Orleans. Since 1936 he has been active in oil exploration and has worked throughout the oil areas of the United States and in foreign fields, principally in seismic interpretation. From 1952 to 1956, he was chief geophysicist for Southern Production Co., supervising its geophysical work. He is a member of several professional societies.

It is interesting also, in the event of concurrence of normal data, to search for the reason for drilling these tests. Obviously, a different interpretation must have been made by someone from data probably other than yours. Or, could your data also indicate an anomaly? Try recontouring the seismic depth points the way you think it should look.

However, it is the first case, that of disagreement, in which you are most interested. If a fault was missed on the seismic interpretation, why was it missed? And could it be seen on review, now that you know where to look for it? Perhaps there is evidence that will help in locating other faults. Your well control may indicate an appreciable change of section, thickening or thinning. Are the seismic maps at the proper depths to help explain this? The original work may have been done on the premise of a gradual depositional change. Subsequent analysis could indicate an unconformity or possibly a buried fault to be the most logical explanation.

At this point get out your original plotted cross-sections from storage and put the new subsurface data on the appropriate ones. Or, if you have the more recent record sections, plot your wells on them.

Chances are your thinking relative to deeper pay horizons and structural possibilities has changed since you last considered the seismic work. Many seismographs made even 20 years or more ago will have a few deep reflections which may or may not have been plotted on the sections. In some cases they indicated radical dips which were completely incongruous with the shallower data and therefore were neglected. However, these reflections are as true today as they were years ago and it may not take very many, used with your deep-well control, to set up a buried prospect. Perhaps it doesn't warrant a deep test right now, but the addition of a few lines shot in critical places might point to your next discovery.

Data Exchange

It is quite possible that many of the "leads" developed from your old data will occur on the edges of your prospects. The first question to answer is this: Do you have an earlier or later survey over your lead that has never been integrated with the other? If you have, the additional information you need may be right in your files. If not, you should look elsewhere for adjacent information before recommending a new and expensive shooting program.

The data may be as close to you as the next office. Surely someone has shot the area you want. The problem is to find out who has, then trade data. He may have current interests in one of your old prospect areas hundreds of miles away, or just be pleased to augment his coverage. The best results of such a swap would be separate discoveries for each of you. The greatest loss would be your time and trouble spent in condemning a possible prospect.

This is not meant to imply that your old data can supplant a new survey in any but a few cases; but chances are that they can save you considerable time and money, if you do additional shooting, by helping you program the job.

The increase in your seismic coverage resulting from data exchanges and the reevaluation of even sparce, deep information may be the spark to set off more creative and imaginative thinking by your exploration personnel. The result of this approach to better cooperation and use of data should be a reduction in cost per barrel of oil discovered.

NTGS members are, left to right: H. J. Fitzgeorge, Magnolia Petroleum Co., program chairman; E. L. Smith, Independent, vice chairman; J. H. Pittinger, Shell Oil Co., general chairman; and N. G. Creager, Continental Oil Co., secretary-treasurer. All are members of the North Texas Geological Society, sponsor for the convention.

Geologists plan regional meeting

PLANS are currently being formulated for a regional meeting of petroleum geologists to be held in Mineral Wells, Tex., on October 22-25, according to an announcement by the convention chairman, J. H. Pittinger of Shell Oil Co., Wichita Falls.

This will be the first annual meeting for the Southwestern Federation of Geological Societies, a newly organized group representing over 2,900 members with local chapters in Abilene, Midland, San Angelo, Lubbock, Fort Worth, Dallas, San Antonio, Wichita Falls, and Roswell, N. M.

A full 2-day technical program is being arranged for Thursday and Friday, October 23 and 24, with a variety of papers stressing the geologic framework of the southwest and the relationship of the areas covered by the SFGS. A panel discussion will be held at the end of each day's session.

Several companies associated with various phases of the oil industry, educational institutions, and the local geological societies will sponsor exhibits. These will be on display at the Civic Auditorium and at the Baker Hotel, convention headquarters.

The meeting will close on Saturday, October 25, with a field trip under the leadership of John Kay of Wichita Falls. A 2,500-ft. section of Pennsylvanian rocks will be observed along a scenic route in the Brazos River Valley of Palo Pinto County. Stops will be made to examine surface outcrops that can be correlated with the pay zones in many important Strawn and Canyon oil fields.

Borden County find completed in Texas

Cheyenne Oil Co., Wichita Falls, Tex., has completed its 1 Clayton & Johnson in southwestern Borden County as a prolific Fusselman discovery.

On final test the well gaged 469 bbl. of 43°-gravity oil in 6 hours through 24/64-in. choke, to give it a daily rate of 1,876 bbl. per day. Pay perforations were at 9,726-36 ft. Flowing tubing pressure was 800 psi.

On elevation of 2,465 ft., the well logged the following tops: Spraberry 5,892 ft., Dean sand 7,290 ft., Pennsylvanian reef 8,169 ft., Fusselman 9,690 ft., and the Ellenburger at 9,810 ft.

Location is approximately SW NE Section 40, Block 32, T4N, T&P Survey. It is 4½ miles north of Vealmoor and 2½ miles east of Good field. Production is from a stratographic trap, according to Cheyenne Oil. Nearest comparable production is 8 miles to the south at Luther field in northern Howard County. Cheyenne Oil holds a total of 1,186 acres in the area of the discovery, on farmouts from The Texas Co., and Gulf Oil Corp.

Cheyenne Oil has staked location for a north offset to the discovery, as the 2 Clayton & Johnson. It is projected to 9,800 ft.

New gas found in Pennsylvania

AFTER MANY YEARS of extensive planning and research, New York State Natural Gas Corp. has discovered gas in the Boone Mountain area of Clearfield County, Pennsylvania. Located near Penfield, the successful wildcat well was drilled in a region considered by many to contain no gas. Initial flow from the well was 1.3 M.M.c.f.d. of gas. Fracturing of the well increased the flow to 6.3 M.M.c.f.d.

The discovery represents many years of geological study and exploration planning, a company spokesman said.

The well is located on Pennsylvania state forest land. When the well is tied into the company's system, royalties from it will be paid into the state's oil and gas-lease fund. Further drilling in the area will be required to determine the importance of the pool.

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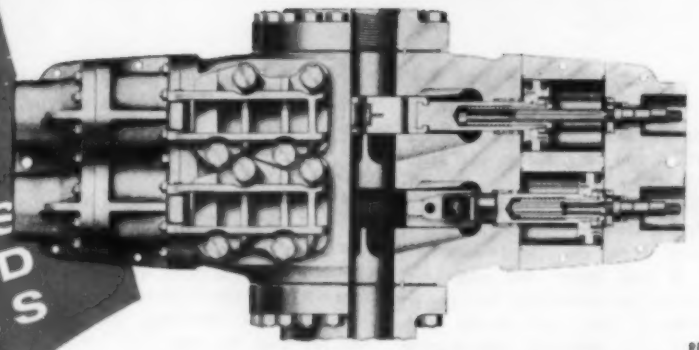

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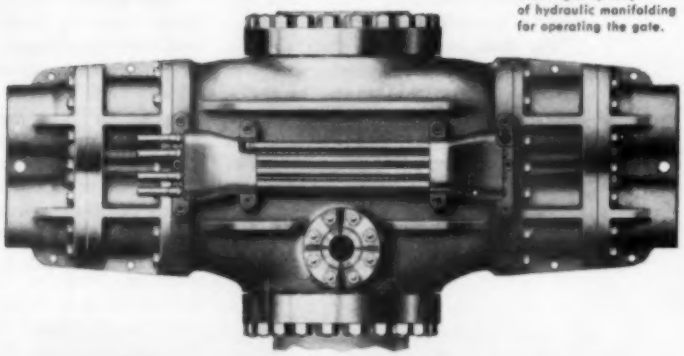

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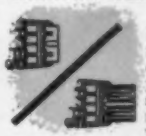

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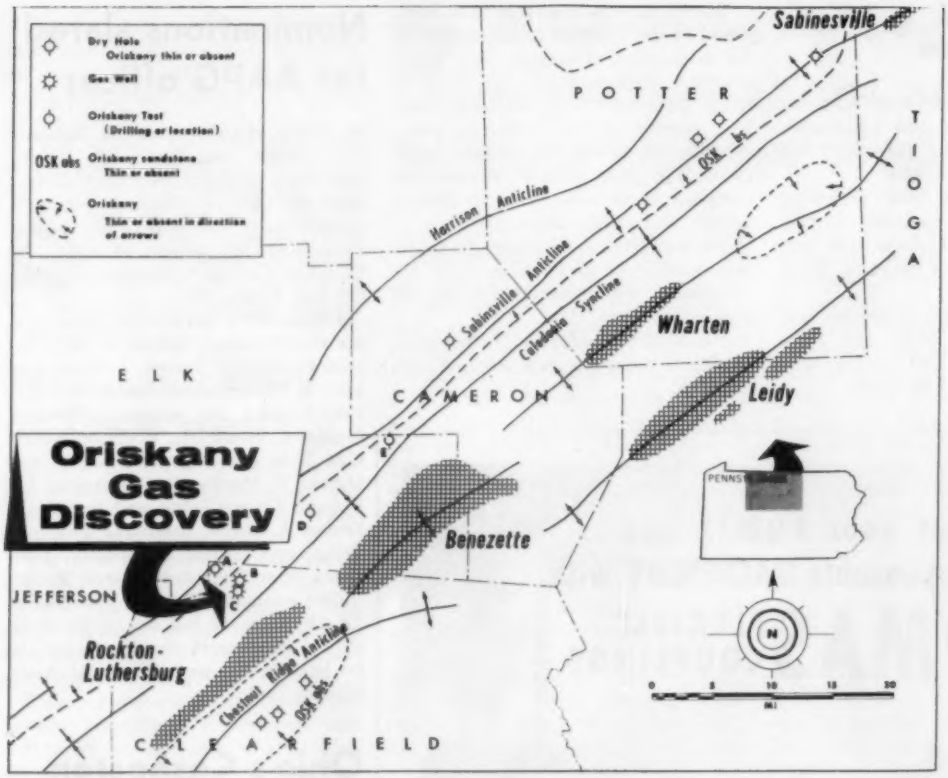


Along the Sabinsville anticline

Oriskany pays in Pennsylvania

A THREE-TEST WELL Oriskany sandstone exploration program by New York State Natural Gas Co. in northwestern Clearfield County, Pennsylvania, was successfully completed last week when the State of Pennsylvania 1 Tract 65 well (C on map) flowed gas at the rate of 6 M.M.c.f.d. after hydraulic fracture of the Oriskany at 7,310-26 ft. Wellhead pressure is 3,850 psi.

The discovery sets up a 90-mile-long potential stratigraphic-type producing trend for wildcatters along the southeast flank of the Sabinsville anticline. This trend extends from central Jefferson County on the southwest to southern Potter County on the northeast.

The theory leading to this wildcat discovery evolved during the development of the Rockton-Luthersburg-Anderson Creek field, located southeast across the Penfield syncline from the Tract 65 well. This field is a stratigraphic-type trap resulting from an

BY CARL H. ROBERTS
Roberts & Hessin, Geologists,
Coudersport, Pa.

updip pinchout of the Oriskany sandstone toward the crest of the Chestnut Ridge anticline. On the assumption that the sand body carried across the Penfield syncline and up the flank of the Sabinsville anticline the potential trapping situation was indicated.

The first test drilled by New York Natural was the 1 Logan Bond (A on map), which discovered the Oriskany sandstone to be absent on the crest of the anticline. Subsequently, the 1 Tract 66 (B on map) test was drilled. It penetrated 24 ft. of Oriskany with a show of gas at a structural depth approximately 1,500 ft. lower than the Bond test.

The discovery well is 118 ft. lower structurally than the 1 Tract 66 test and encountered a natural flow of 1,200 M.c.f.d. after penetrating 16 ft. of sand.

New York State Natural has jumped ahead on the new wildcat trend with two stepout tests (D and E) 10 and 20 miles northeast of its discovery.

Sabinsville anticline is one of the most pronounced anticlines in North Central Pennsylvania. Its axis parallels and is immediately inside the postulated southeastern edge of a large area in which the Oriskany sandsone is absent. All of the test wells drilled on this anticline have been on the crest and all have found the Oriskany sandstone absent except in Tioga County where the Sabinsville and Tioga gas fields were developed.

With the Clearfield County discovery as the incentive, area operators have started an intensive lease play along the length of the Sabinsville anticline. With the possibilities in favor of the Oriskany wedging out on the southeast flank of this structure, a major gas-producing area may be in the making.

Alaska included in new year book

THIS YEAR'S "Year Book" of the National Oil Scouts and Landmen's Association includes, for the first time, a section on Alaska.

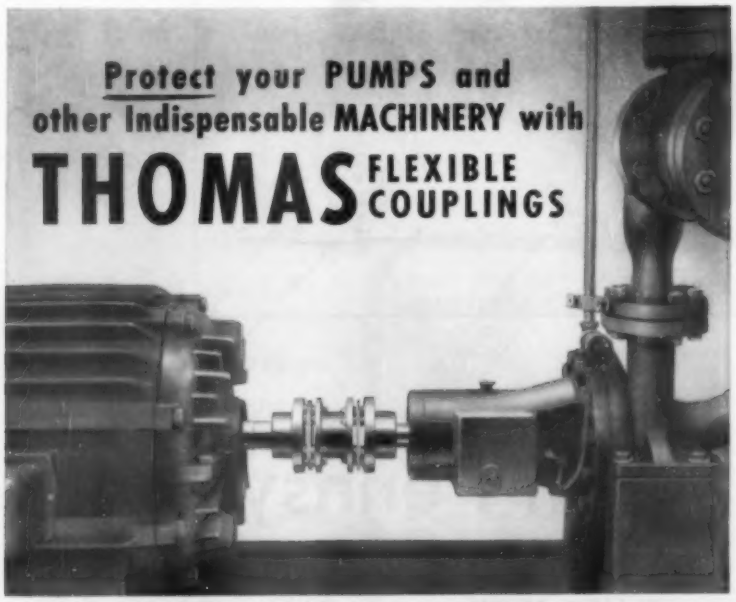
Publication of the book, reviewing 1957 oil and gas activity in the United States and Canada, has just been announced by George B. Ross, editor-in-chief.

The Alaska section augments sections on 33 other states and three Canadian provinces. All sections total 1,136 pages in the 5-lb. book.

The book, now available, was composed in the national headquarters of the association at Austin, Tex. Ross, assistant division scout for Humble Oil & Refining Co. at Midland, Tex., is a member of the seven-man executive board which supervises publication. He heads a list of 49 other oil company scouts who serve as district editors and contributors.

The compilation embraces the year's information on exploration, field development, and statistics for the oil and gas industry.

Headquarters address of the association is postoffice box 1095, Austin 66, Tex.



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Nominations slated for AAPG offices

W. DOW HAMM, Atlantic Refining Co., Dallas, and Lewis G. Weeks, consulting geologist, Westport, Conn., head the slate of officer nominations submitted by the AAPG nominating committee, as announced today by President George S. Buchanan, Husky Oil Co., Cody, Wyo.

Other 1959 officer-nominees are: for vice president, Alfred H. Bell, Illinois Geological Survey, Urbana, and Leo R. Newfarmer, Shell Oil Co., Los Angeles; for secretary-treasurer, George C. Grow, Jr., Transcontinental Gas Pipe Line Corp., Newark, and Harold T. Morley, Pan American Petroleum Corp., Tulsa; and for editor, Daniel A. Busch, consulting geologist, Tulsa, and Grover E. Murray, Louisiana State University, Baton Rouge.

The winners will take office March 19, 1959, on the last day of the 44th-annual meeting of the association, to be held in the new Memorial Auditorium, Dallas.

Ohio's Coshocton gets gas discovery

NEW ACTIVITY in Ohio includes a gas discovery in Coshocton County, and a significant southeast extension of oil production to Hermanville pool, in Canaan Township, Wayne County.

The gas discovery is by F. E. Edward and others at their W. M. Mackwert well in Lot 13, Keene Township. It is just north of the village of Keene. The well logged Clinton sand at 3,600-50 ft. with a gage of 150 M.c.f. of gas, natural, and 1,200 M.c.f. after fracturing.

The Hermanville extension is by C. R. Obermiller and others at their 1 Henry Gasser, which had the Clinton at 3,394-3,403 ft., and gaged 125 bbl. of oil and 750 M.c.f.d. of gas after fracturing.

Louisiana well confirms Chalkley

NEARLY 1½ YEARS after the completion of the discovery well of Northwest Chalkley field, in southeastern Calcasieu Parish, Louisiana Gulf Coast, W. E. Walker, discovery operator, is completing his second well to confirm the discovery.

His confirming well, 1 Sweet Lake Land & Oil Co., is southwest of the

discovery well, 1 Walker-Corbella, completed in March 1957. It is productive of gas and condensate from casing-perforated interval at 11,244-51 ft.

Flow through 13/64-in. choke was at the rate of 1,399 M.c.f. of gas and 75 bbl. of condensate per day. Flowing pressure was 3,325 psi.

The discovery well is perforated at 11,274-83 ft., and flowed initially at the rate of 1,500 M.c.f. of gas and 32 bbl. of condensate per day through ¼-in. choke.

Wilcox discovery on Texas coast

WILCOX SAND is proving productive in another wildcat along the DeWitt-Victoria County line, in Texas' central coastal area.

The new discovery, by Harkins & Co. and George A. Musselman, is about a mile east of Thomaston, just inside DeWitt County. It is about a mile south of Jennie Bell field, nearest comparable Wilcox production.

Cleaning through ⅛-in. choke, the Harkins-Musselman 1 Atkinson well flowed 90 to 100 bbl. of clean oil per day with pressure of 775 psi. Pay is perforated at 7,990-92 ft. Hole had been drilled to 9,013 ft.

Men and equipment are ready, but

Canadian operations are tied to tricky weather conditions

PRELIMINARY PLANS have been completed and a major part of the rest is up to the weather man and out of the hands of the many engineers and geologists that have laid the plans to date.

Latest reports from the operators indicate that the Swan Hills-Virginia Hills region of northwestern Alberta, 120 to 140 miles north-northwest of Edmonton, will be a very active locale when colder weather makes it possible to move men and equipment into the area to carry out the exploration projects of the region's many exploration firms.

Discoverer of the first oil in the area, Home Oil Co., Ltd., and its partners, have already announced plans for the drilling of at least 24 wells, and other operators, including Imperial, Pan American Petroleum Corp., Mobil Oil of Canada, Ltd., and General American Petroleum Corp., are making preparations for the big push into the area after freeze-up.

This particular play along with others of lesser magnitude in the northern Alberta regions, northeastern British Columbia and the Yukon and Northwest Territories will swing many of the rigs now idle in western Canada back onto the active list. The Swan Hills-Virginia Hills exploration and development operations planned this fall and winter will have a great bearing on activity next summer, for if the region develops as anticipated it will likely result in permanent road construction that will enable firms to work on a year-round basis in the present wilderness area.

An excellent example of the current situation in the area can be found in the fact that one drilling rig, which was operated in the area too late last spring, remains stacked on the location of the well which it drilled, unable to be moved out due to terrain conditions. The contractor has been paid rig time ever since.

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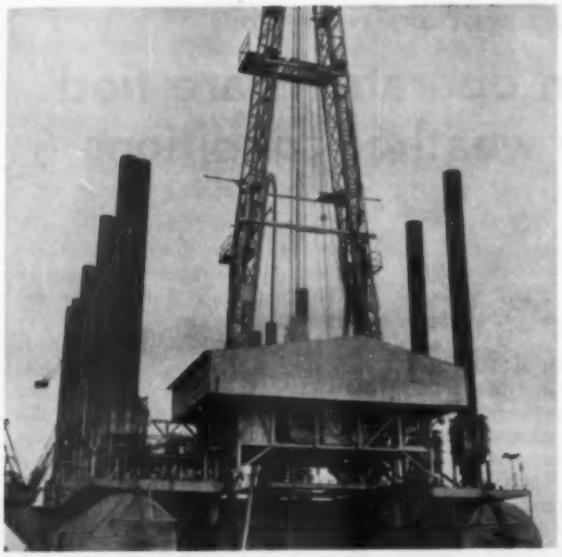

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acreage in close proximity to proved production sell for about $1.5 million per section, and a wildcat reservation sell for $6.5 million will add impetus to the purchasers and drilling crews alike.

The area's wells will be opened up, tested and placed on production and will take a share in the curtailed output of the province's oilwells. So that these wells won't have to be shut in come next spring pipeline construction crews are presently working, where they can, on an oil-transmission line into Edmonton, and when the ground is firmed up the race between the team of men and machines and Mother Nature will be on in earnest. The pipeline to transport the production from the wells is being backed by Home Oil Co. through its wholly owned subsidiary Federated Pipelines, Ltd.

Drill sites presently picked by Home and its partners, including Texaco Exploration Co., United Oils Ltd., and Kern County Land Co., are development locations either on lease selected from original reservation spreads, or recently purchased Crown Reserve rights. Locations for the group's initial tests on reservation lands that were bought last April, and which lie 3½ to 20 miles southeast of the Swan Hills oil completions, have yet to be announced.

The next Alberta Government Crown Reserve sale of petroleum and natural-gas development rights could add more development work in the region as five new half section parcels, all within 2 miles of the area's eight oil completions are up for grabs at a sale scheduled for October 16. Despite a general lowering in bids for Crown Reserve rights bonuses on these tracts could top the $2 million mark.

Queen Charlotte . . . The Queen Charlotte Islands, lying off the west coast of British Columbia, about midway between Vancouver Island and the Alaskan Peninsula, have now recorded their first drilling completion, designed specifically to test for oil and gas. And, like many other areas of the world presently undergoing exploration for petroleum production, the well was a duster.

However, the information gained for the geologists by the drilling of this well, when added to the data on the next six wells proposed by Richfield Oil Corp. of California, will give that company something to go on and direct future exploration on the islands. The region has every indication of harboring oil and gas-bearing structure and Graham Island in particular is almost completely blanketed by petroleum and natural gas exploration permits. A recent move by Midwest Oil Corp. of Denver, Colo., gave it and its partners a 400,000-acre spread of permit rights that adjoins the lands now being explored by Richfield.

The dry hole just completed by Richfield, its Masset No. 1 test (53° 58′ north latitude and 132° 51′ and 3″ west longitude, was not actually carried to projected depth as it encountered volcanic rock sooner than anticipated and was abandoned in that section at 1,840 ft.

Drilling equipment used to drill this test is presently being moved to the northeastern tip of the island where it will drill the company's Tow Hill wildcat. Although some of the large spread of permit rights held by Richfield were acquired by itself, major part of the large block was obtained under farmout agreement from Canadian independents Canadian Homestead Oils, Ltd., and Consolidated Mic Mac Oils, Ltd.

Midwest Oil Corp.'s partners in its newly acquired lands include a Canadian company, Canadian Exploration Co., and a U. S. firm, Peerless Oil & Gas of Texas. The rights were purchased from Bertram I. Nesbitt of Vancouver.

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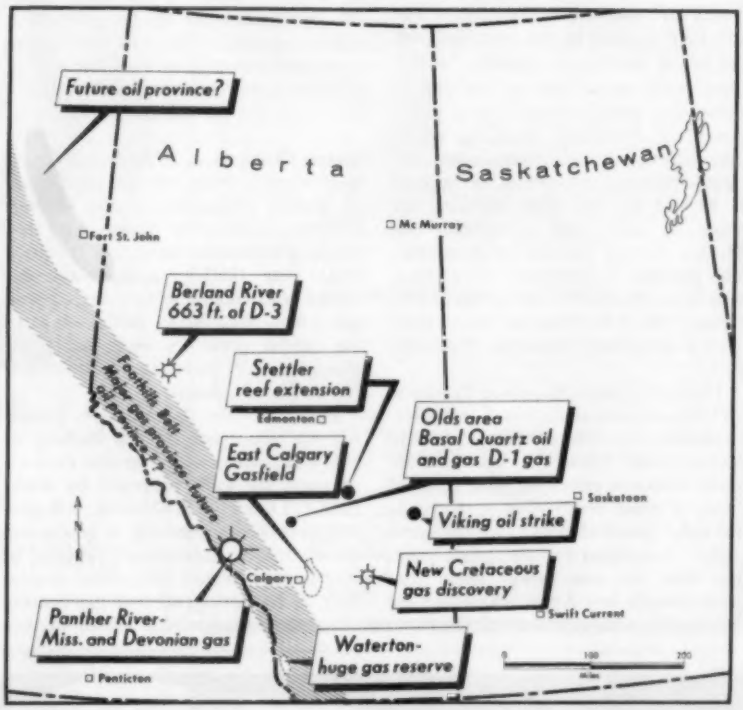
Despite outlet problems

Canadian exploration flourishes

OIL AND GAS EXPLORATION is booming in Canada, despite the uncertainty of pipeline outlets.

Significant discoveries in the foothills belt in the past few years have converted this complex area into a major gas province. The British Columbia gas play continues to expand and will eventually push northward into the Northwest Territories. The reef play, touched off by the Leduc discovery, has been given new impetus with the British-American Oil Co., Ltd., and Shell Oil Co.'s joint operation, Berland River. Operators are now exploiting the oil and gas reserves of the Cretaceous sands, long ignored in the quest for deeper reef production.



CANADA'S numerous pay zones vie for headline honors as operators log new discoveries.

Foothills play . . . Many of the complex overthrust folds of the foothills belt apparently harbor tremendous gas reserves, with most of the production to date from the Mississippian limestone. Waterton, near the international boundary, discovered in 1957, has already blossomed into a major gas field. Five wells have proved production along an 18-mile trend. Recently The Texas Co. established Devonian gas reserves at Waterton and new pay zones like the Devonian accentuate the importance of the entire foothills belt.

Will the structure yield oil? This is a question paramount in the oil-finder's mind as operators continue to add gas discovery upon gas discovery in the foothills play. Thus far Turner Valley, discovered in 1914, has been the only important oil field. Initially, however, Turner Valley was a gas field until the oil column was tapped by flank wells. The customary procedure is to stake a wildcat on the top of the structure, and the chances are excellent that it will enter the gas cap. It is quite possible that oil will eventually be found on the flanks of some of these large foothills structures, since this happened at Turner Valley.

Shell Oil Co. is currently testing its Panther River strike. The well is a two-zone discovery with gas production from both the Devonian and the Mississippian. Its location is 28 miles northeast of Banff and 63 miles northwest of Calgary. The Devonian had flow rates up to 7 M.c.f.d. from a pay section having a gross thickness of 183 ft. The well apparently cut a fault and found Mississippian gas production below 12,264 ft. There is some question as to whether the Mississippian gas production will be commercial, but the well flowed at a measured rate in excess of 5 M.c.f.d. after acid treatment.

British Columbia, too, like the foothills belt, could become an important oil-producing area. Most of the wells drilled to date have been on the crests of the structures, and some flank wells now are being completed as oil producers rather than as gas wells.

Reef play . . . Operators are testing the significant Berland River discovery 100 miles north-northeast of Jasper (LSD 8-4-59-23w5). The strike logged 663 ft. of gross pay section in the D-3 zone (Devonian); 550 ft. of this is considered effective wet-gas pay. On tests, the well flowed at the rate of 57 M.c.f.d. from the pay section between 12,014-12,677 ft.

Tennessee Gas Transmission Co. is finding new production on the west flank of the Stettler reef field. The initial test, completed in June 1958, found 30 ft. of oil column above water. The confirmation test, a ¾-mile south offset, encountered approximately 45 ft. of reef pay above water. TGT is currently completing this well and has staked location half a mile south of the latest producer.

Olds area . . . The Olds area is rapidly developing into an important new gas and oil field with production from the Basal Quartz sand and the De-

Mobile Hits

Mobil Oil of Canada, Ltd., recovered Viking oil from a wildcat in the Hutton district, 85 miles west of Calgary. Operator tested the Viking interval 2,904-34 ft. and the well flowed at the rate of 15 bbl. of oil per hour during the 52 minute test. Mobil is currently running casing at 4,078 ft. although the test is slated as a Cambrian test with a scheduled depth of approximately 7,300 ft.

vonian. Primarily a gas area, the Hudson's Bay Oil & Gas Co. found a show of oil in the Basal Quartz in a recent stepout. The well recovered 300 ft. of light-gravity oil on a drill-stem test. Hudson's Bay has three rigs busy outlining the Olds field, exploiting both D-1 and Basal Quartz zones.

Cretaceous sands . . . Two widely separated Viking sand discoveries point up the importance of the Cretaceous sands to Canadian oil and gas operators. Canadian Chieftan Petroleums, Ltd., recovered nearly 1,000 ft. of oil from Viking sand interval 2,611-55 ft. The well is located on the south side of the Provost gas field, a Viking reservoir.

To the southwest, W. E. Bakke has a possible gas producer 70 miles east of Calgary. In addition to the Viking, the well flowed gas on drill-stem test of the lower Blairmore. It is 1¼ miles northwest of the discovery well of the Gem area.

Registrations soar for SEG meeting

ADVANCE registrations for the Society of Exploration Geophysicists' annual convention in San Antonio, October 13-16, are soaring sharply after a slow start.

Initial fears that the business recession would affect attendance have evaporated. In fact if the present momentum continues San Antonio may even set a new attendance record. With the fast turnaround in general business and oil prospects for the future, many companies seem to be taking a second look.

A lag of 1 or 3 years between the time new developments are discussed in scientific papers and their application to oil finding is not uncommon.

The program certainly justifies a new look by the companies.

J. O. Parr, program chairman, reports the combination of number and quality of papers offered has set a new record. He is in the position of having almost an embarrassment of riches. However, the municipal auditorium, where all sessions will be held, has ample facilities, and some days will see as many as three concurrent sessions.

One half day will be devoted to papers on the geology and geophysics of Mexico, all top papers carefully selected by the scientists of the government oil company, Petroleos Mexicanos. In addition one of the featured speakers at the convention will be Sen. Antonio J. Bermudez, president of Pemex.

East Texas gains Smackover hit

EAST TEXAS developments for the week included one Smackover discovery completed, another showing gas and raising a lease play; and a Travis Peak new-pay discovery completed in a shallow field.

Humble Oil & Refining Co. has completed its 1 Emma Walter as a discovery in extreme eastern Cass County, opening the Bloomburg field. Calculated open-flow potential was 1,600 M.c.f.d. of gas, plus an estimated 23 bbl. of 46.9°-gravity condensate. Perforations were at 10,380-90 ft. Total depth was 11,063 ft. Top of the Smackover was 10,329 ft. on elevation of 283 ft. Flowing pressure on a previous test, through ¼-in. choke, was 1,500 psi. on the tubing.

Location of Humble's well is near the eastern Cass County line, 2 miles north of the town of Bloomburg, on Cass County School Land Survey, A-174.

Discovery prospect . . . R. J. Caraway and Three States Natural Gas Co. were testing the Smackover in north-central Van Zandt County, near Fruitvale. The 1 W. E. West was reported flowing gas, with no gage or estimate on the volume.

Field sources said the well had logged approximately 100 ft. of pay. The well was drilled to 12,750 ft. and cased to 12,740 ft. A drill-stem test in Smackover limestone at 12,223-12,356 ft., using ¼-in. chokes, had gas in 13 minutes under 400 psi. pressure. After flowing gas for 15 minutes, the tool plugged and it was shut in. In 20 minutes pressure read 3,260 psi.

Operators of the well were said to hold approximately 1,600 acres in the area of their prospective discovery. News of the gas flow set off one of the largest lease plays for that area, involving nearly all major companies.

Marion County . . . Amerada Petroleum Corp. and Wiggins Brothers, Inc., have completed 1 C. C. Braden as a Travis Peak discovery in the shallow (Tokio sand) area of eastern Marion County.

Completion was for 89 bbl. of 46.8°-gravity oil a day through 17/64-in. choke. Flowing pressure was 700 psi., with gas-oil ratio of 6,717:1. Production was through perforations at 6,454-67 ft. Location is 6 miles east of Smithland in the Thomas E. Tucker Survey, A-366.

Drillers' interest is drawn to Galveston Bay strike

TEXAS' Galveston Bay continues a "happy hunting ground" for additional oil and gas fields.

Latest addition is a gas-condensate discovery by Shell Oil Co. in Tract 139, in the eastern arm of the bay. It is 1½ miles off the Chambers County shore, in Galveston County.

The new discovery well, completed last week, is rated good for 3,800 M.c.f.d. of gas with condensate recovery in the ratio of 56,900 cu. ft. of gas per bbl. of liquid. Gravity of the condensate is 56.9°. Flowing pressure through ⅜-in. choke with production at the rate of 3,057 M.c.f.d. of gas was 1,340 psi.

Production is from casing-perforated interval at 10,977-90 ft. in the 13,515-ft. hole.

Location is 14 miles northeast of Galveston. It is about 2 miles northeast of Hanna Reef field, also in the bay, and about 3 miles southeast of East Smith Point field.

. . . and a gas find in Matagorda County

INTEREST in the Midfields-Tidehaven area of northwestern Matagorda County, Texas Gulf Coast, is being stirred by a new gas discovery by Roy R. Gardner and Cyprus Oil Co.

The discovery is about 2 miles southeast of Midfields. It is about a mile south of North Tidehaven field, and about 2 miles northwest of the original Tidehaven field. The much-larger Midfields field is about 4 miles west.

The Gardner-Cyprus discovery well, 1 Pierce Estate, is rated good for 7,500 M.c.f.d. of gas. Gas yields 48.9°-gravity condensate in the ratio of 129 M.c.f. per bbl.

Completion is in sand at 6,814-19 ft. in hole drilled to 6,885 ft.

California's Kern County reports good test results

EARLIER REPORTS of excellent tests were confirmed when Reserve Oil & Gas Co. completed 308-18 "W-T" as an important extension to the recently opened Highway pool in the booming North Tejon field, Kern County.

At the time of completion, Reserve also revealed the earlier tests results. On a test of the Vedder sand from 9,900-10,365 ft., it flowed a rate of 2,700 bbl. daily through a 20/64-in. choke of clean 35°-gravity crude. It flowed at even higher, but unrevealed, rates prior to being choked back to 20/64-in.

For completion, the operator pinched it back to 13/64-in. choke and it was making 650 bbl. daily of 34.2°-gravity crude, 1.5% cut. The perforated intervals are in the Zemorrian at 9,899-9,989 ft., 10,019-10,105 ft., and 10,139-10,365 ft. Total depth is 10,970 ft.

This well is a northeast offset to the fault block discovery made by Richfield Oil Corp. just 100 ft. or so off the main north-south Highway 99.

San Emideo Nose . . . In the closely watched San Emideo Nose field 12 miles west of North Tejon field, Richfield Oil Corp. was drilling below 11,808 ft. on an extension test ½ mile northwest of the discovery well and had staked location for the second extension effort in the new field, 2,000 ft. northeast of the discovery well.

Meanwhile, this whole general area, including sections bordering the 9-11n-21w section of the discovery well, has been the scene of a flurry of leasing lately. It is generally conceded Richfield has a very strong land picture in the play but a number of other major operators have substantial holdings close by.

Town-lot drilling . . . Town-lot drilling in metropolitan Los Angeles decreased by one well when Morgan Brown suspended operations at 9,008 ft. on his wildcat located on the east edge of Beverly Hills in West Los Angeles.

This test was plagued with difficulties from the start, which dates back almost 2 years when the derrick was originally erected just off the fashionable restaurant row on La Cienege Boulevard. It wasn't until March 3 of this year Brown finally spudded in the test. Even then it drilled only about 1,000 ft. and then was halted again by legal squabbles. He finally got it going for keeps late in July apparently only to find nothing encouraging.

The area Brown was drilling is the scene of the old Salt Lake field discovered and developed around 1902-05. There are still seven wells producing nearly 200 bbl. daily there. These wells, however, are completed in the old shallow zone at around 1,900 ft.

Elsewhere in residential areas of the city, Signal Oil & Gas Co. was drilling below 4,680 ft. on its second test of the private Hillcrest Country Club and was fishing in an 11,978-ft. wildcat on the neighboring city-owned Rancho Golf Course. On the Los Angeles Country Club course, Hudson Gas & Oil Corp. was drilling below 8,895 ft. and had staked a location for a second test on the golf course. Both of the Reserve wildcats and Hudson's are located in West Los Angeles on the Beverly Hills border and are aimed at tapping the same pay which has proven so productive for Universal Consolidated Oil Co. on the Twentieth Century Fox movie lot. The movie lot divides the Hillcrest and Rancho links from the Los Angeles Country Club course.

California highlights . . . Disaster hit the Porter Sesnon extension test to its Vernalis gas-field discovery in San Joaquin County when it caught fire while being tested. First reports indicated the Santa Fe Drilling Co. rig on the well was destroyed. The fire ignited at the flow line. The crew was able to scramble to safety unharmed. Efforts were being made to bring the 3,562-ft. test under control. . . . Franco Western Oil Co., Inc.'s closely watched wildcat 2½ miles northeast of Oxnard field in Ventura County proved a dry hole and was abandoned after tests at 7,022 ft.

Extension drilled in Throckmorton

Sunray Mid-Continent Oil Co. has an extension well at its 1-A E. E. Smith in Throckmorton County. On potential tests the well flowed 308 bbl. of 38°-gravity oil a day through 16/64-in. choke, from Upper Caddo pay at 4,456-78 ft. Tubing pressure was 540 psi. Operators drilled to 5,001 ft. and reported top of pay at 4,456 ft.

Location is 3½ miles southwest of Throckmorton in Section 226, BBB&C Survey. It is ½ mile southeast of the same operator's 1 Smith, recently completed discovery of Upper Caddo in the area.

Sunray Mid-Continent has also filed discovery application for its 1 H. B. Sewell, central Jack County wildcat, as a Bend Conglomerate discovery. Location is 7 miles northeast of Jacksboro and approximately 1 mile south of the Avis-East Brison area, in T. H. Hudson Survey, A-316.

Potential on the well was 72 bbl. of oil a day from pay at 5,573-81 ft. Nearest similar production is said to be separated by pinchout. Suggested new field name is Maryetta-Bend conglomerate. Sample top on the Bend was 5,313 ft.

Casing run on Pennsylvania find

CASING was being run this week on an apparent new discovery in the Appalachian basin in Pennsylvania. The Crawford County prospect was reported by John O. Maberry of Hamilton Oil & Gas Corp., Denver, Colo., who drilled the test on a 1,336-acre block.

Drilled to the Medina sand, operator reported 40 ft. of oil sand in the interval 3,402-42 ft. and good oil shows from 3,498-3,520 ft. No tests were run until production string had been set.

Benedum-Trees Oil Co. made the first discovery in the area last September, the first production in Crawford County in over 50 years.

New prospect marks the third commercial completion for Hamilton, organized in Denver less than 1 year ago. Company has a gas producer in the Denver-Julesburg basin, already delivering gas to the Colorado Interstate system, and an oil well in the Cottonwood Creek area of northern Wyoming.

McCulloch Drilling Washington test

McCulloch Oil Exploration Co. of California, Inc., was drilling below 3,262 ft. on 1 McCulloch-Krainick, its third wildcat effort in the last 2 years on the Kummer anticline 20 miles east of Tacoma.

McCulloch's two prior efforts were located about 1 mile north of this current test. The earlier wildcats, both of which reported some shows, went to 6,023 ft. and 4,326 ft. respectively.

Successful Wildcats

KANSAS

Bowman & Grissmore 1 Davis, NE NW NW 29-32s-3e. IP 15 BOPD, Bartlesville sand 3,131-37 ft. TD 3,240 ft.

Graham County: Leben Drilling Co. 1 Hutton, SE SE NE 1-8s-24w. IP 105 BOPD, 37.5°, Lansing-Kansas City 3,764-67 ft. TD 4,060 ft. Opens Hutton pool.

Burch Drilling Co. 1 Mitchell, SE SE SW 20-9s-24w. IP 31 BOPD, 38°, Lansing 4,053-56 ft. TD 4,115 ft. Opens Mitchell pool.

Woodman & Jannitti and E. J. Carver 1 Swank, NW NW NW 4-9s-22w. IP 73 BOPD, 22°, Arbuckle 3,903-13 ft. TD 3,913 ft. Opens Swank pool.

Harvey County: Renfro Drilling Co. and J. D. White 1 Corfman, SW SW NW 35-24s-2e. IP 45 BOPD, 43.8°, Burgess sand 2,853-56 ft. TD 2,895 ft. Opens North Dubois pool.

Kiowa County: Homer Ogden 1 Russell, NW SE NE 13-28s-19w. IP 18 BOPD, 38°, Lansing 4,290-96 ft., 4,269-79 ft. TD 4,890 ft.

Pratt County: Twin Drilling Co. 1 Barry, SE SE NE 24-28s-15w. IP 6 BOPD, 41.7°, Miss. 4,548-58 ft. TD 4,727 ft.

Mull Drilling Co. 1 Chitwood, SW SW SE 30-26s-15w. IP 4,633 M.c.f. of gas per day, Kinderhook 4,377-81 ft., 4,383-88 ft., 4,397-4,401 ft., 4,409-4,415 ft. TD 4,578 ft. Opens Southwest Tatlock pool.

1 Doggett, NE NE SW 17-26s-15w. IP 6,150 M.c.f. of gas per day, Lansing 4,031-37 ft. TD 4,685 ft. Opens Hopewell pool.

Sedgwick County: Time Petroleum Co. 1 Harpster, NW NW NE 26-25s-1w. IP 25 BOPD, 35°, Hunton 3,576-79 ft. TD 3,579 ft. Opens new pay in Cross pool.

Sherman County: Phillips Petroleum Co. 1 Llanos, C W½ NW NE 10-6s-37w. IP 319 BOPD, 23°, Cherokee 4,804-12 ft. TD 5,000 ft.

Sumner County: Shawver-Armour 1 Horsch, SE SW SW 4-31s-1w. IP 40 BOPD, 43.8°, Miss. 3,664-72 ft. TD 4,173 ft. Opens Horsch pool.

A. C. Lawson 2 Crowe, SE SE SW 10-35s-1w. IP 16 BOPD, 35°, Layton 3,245-46 ft. TD 4,511 ft.

Wabaunsee County: William Gruenerwald 1 Ashburn, NW NW SE 29-14s-10e. IP 80 BOPD, 22°, Viola 3,257-62 ft. TD 3,262 ft. Opens Ashburn pool.

OKLAHOMA

Alfalfa County: Amerada Petroleum Corp. 1 Morgenson-Jennings, NE SW SE 15-25n-12w. IP 12 BOPD, 36.7°. Mississippian lime 6,091-6,101 ft. TD 6,188 ft.

Beaver County: The Texas Co. 1 Ratslaff, C NW SE 5-3n-21eCM. IP 4,275 M.c.f. of gas per day, Chester 6,659-63 ft., 6,667-73 ft. TD 6,714 ft.

Cabot Carbon Co. 1 Mike Albert, 9-5n-26eCM. IP 33,000 M.c.f. of gas per day, Council Grove 3,278-90 ft.; Morrow 6,609-29 ft. TD 6,925 ft. New pay discovery in Mocane gas area.

United Producing Co. 12 R. E. Adams, 36-6n-24eCM. IP 1,915 BOPD, 15 BWPD, Hodges 5,286-5,300 ft.; Oswego 5,592-5,604 ft. TD 6,480 ft. New pay in Mocane gas area.

Comanche County: Richard C. Arrington 1 Vandervort, NE SW NW 1-1n-10w. IP 10 BOPD, 35°, conglomerate 1,350-1,680 ft. TD 1,720 ft.

Owens Drilling Co. 1 Norton, SE SE SE NW 35-2n-10w. IP 8 BOPD, 20 BWPD, 35°, limey sand 1,000-1,070 ft. TD 1,087 ft.

Ellis County: Magnolia Petroleum Co. 1 H. J. Schoenhals, C NE SW 24-21n-26w. IP 13,000 M.c.f. of gas per day, 112 BDPD, Morrow 9,243-61 ft., 9,582-9,605 ft., 9,683-97 ft., 9,762-75 ft. TD 10,316 ft. Opens East Goodwin field.

Grant County: J. A. Champlin 1 Leona J. Duvall, C SE NW 30-25n-3w. IP 2,000 M.c.f. of gas per day, Skinner 4,942-62 ft. TD 5,338 ft.

Woods Petroleum Corp. 1 McBride, C NE NE 26-28n-6w. IP 10,576 M.c.f. of gas per day, 10 BOPD, 60°, Cherokee 4,760-4,770 ft. TD 4,858 ft.

Kay County: Anchor Petroleum Co. 1 Constant, SE SE NW 36-27n-1e. IP 15 BOPD, 8 bbl. salt water, 39°. Red Fork 3,692-97 ft. TD 3,854 ft.

Osage County: C. E. Beal 1 Osage, NE NE SW 2-29n-11e. IP 30 BOPD, 39°, Tucker 1,854-62 ft. TD 1,862 ft.

M. F. Ramsey 1 Osage, NW NW SE 14-24n-6e. IP 8 BOPD, 38°, Miss. chat 2,859-69 ft. TD 2,869 ft.

White Star Oil Co. 1-A Osage, SE SE SE 32-26n-8e. IP 3 BOPD, Miss. chat 2,493-2,502 ft. TD 2,903 ft.

J. E. Jackson, Jr. 1 Osage, SW SW SE 30-29n-9e. IP 73 BOPD, 50 BWPD, 38°, Wayside 1,597-1,605 ft. TD 1,652 ft.

Texas County: Petroleum, Inc. 1 Denning, C SE NW 30-6n-11eCM. IP 8,100 M.c.f. of gas per day, Morrow 4,503-10 ft. TD 5,000 ft.

WEST TEXAS

Andrews County: D. L. Dorland 2 Logsdon, Sec. 9, Blk. A47-PSL., new pay in Union field. IPP 102 BOPD, 37°-gravity, San Andres 4,445-4,592 ft. TD 4,800 ft.

Crane County: American Trading & Production Corp. 1 Feldman, Sec. 31, Blk. 1, H&TC, 5 mi. NW Imperial. IP 277 BOPD, 40/64-in., 31.5°-gravity, GOR 800, TP 125 psi., Devonian 5,522-50 ft. TD 5,721 ft., elev. 2,405 ft.

Ector County: J. C. Williamson 1-47 TXL, Sec. 47, Blk. 42, T3S, T&P Sur., on NW flank of Clear Fork and Wolfcamp production, 9 mi. SE Odessa. IPP 185 BOPD, 33°-gravity, San Andres 4,515-30 ft. TD 4,582 ft., elev. 2,928 ft.

Gaines County: Jake L. Hamon 1 Edna Page, Labor 11, League 303, Dawson CSL Sur., 10 mi. SE Seminole. IP 328 BOPD, 18/64-in., 46°-gravity, GOR 1601, TP 600 psi., Pennsylvanian 11,-310-36 ft. TD 12,889 ft., ground elev. 3,153 ft.

Garza County: Shell Oil Co. 1 J. B. Slaughter "CD," Sec. 43, Blk. 2, T&NO Sur., Ellenburger discovery in Happy field. IP 316 BOPD, 8/64-in., 40°-gravity, GOR 222, TP 965 psi., Ellenburger 8,202-23 ft. Strawn IP 368 BOPD, 14/64-in., 8,038-48 ft. TD 8,323 ft., elev. 2,418 ft.

Humble Oil & Refining Co. 92-A State, Tract 263, Galveston Bay. IP 249 BOPD, 5/32-in., GOR 1,402 cu. ft. per barrel, TP 1,600 psi., perforations 8,790-8,805 ft. (Frio). TD 9,526 ft. (New pay in Red Fish Reef field—Segment A).

Calhoun County: Superior Oil Co. 3-D W. L. Traylor, Phillips Dimmitt Sur., A-11. IP 117 BOPD and 2,175 M.c.f. daily, 3/16-in., 48.3°, TP 3,190 psi., perforations 10,895-10,918 ft. (Frio). TD 11,922 ft. (New pay in North Maude B. Traylor field.)

Goliad County: George D. Stevens 3 Johnson, William P. Patterson Sur. (6 miles east of Fannin). IP 125 BOPD, ⅛-in., 25°, GOR 800 cu. ft. per barrel, TP 850 psi., perforations 4,227-32 ft. (Frio). TD 4,352 ft. (New oil pay in Terrell Point field.)

Jasper County: Cooper Petroleum Co. 1 Henderson et al, W. B. Hargrove Sur., A-558 (3 miles northwest of Buna). IP 168-40 BOPD, 3/16-in., 46°, GOR 3,985 cu. ft. per barrel, TP 1,950 psi., perforations 7,485-90 ft. (Yegua). TD 7,613 ft. (New-field discovery.)

Live Oak County: Miller & Fox 1 Lucille Johnson, Refugio CSL Sur., A-396 (12½ miles northeast of George West). IP 56 BOPD, ⅛-in., 29°, GOR 100 cu. ft. per barrel, TP 250 psi., perforations 3,237-43 ft. (upper Hockley). TD 4,116 ft. (New-field discovery.)

A. A. (Bus) Moore 1 Tom Bomer, Live Oak CSL Sur., A-272 (5½ miles northwest of Mathis). IPP 16.15 BOPD, 25°, GOR 465 cu. ft. per barrel, perforations 3,201-17 ft. (Frio). TD 3,850 ft. (New-field discovery.)

Madison County: Woodley Petroleum Co. 1 Walton, Simon Jones Sur., A-18 (5 miles southwest of Madisonville). IP 146.28 BOPD, 7/32-in., 44°, GOR 1,525 cu. ft. per barrel, TP 550 psi., perforations 9,610-29 ft. (Georgetown). TD 10,158 ft. (New pay in Madisonville field.)

Nueces County: Union Oil Co. of California 1 State Tract 448, Corpus Christi Bay. Absolute open-flow potential 21,000 M.c.f. daily, GLR 37 M.c.f. per barrel, 58.3°, shut-in TP 3,395 psi., perforations 8,343-53 ft. (Frio). TD 9,100 ft. (Discovery well Tri-Channel field.)

The Texas Co. 1 Jauer, Section 410, John T. Luter Sur., A-853 (2½ miles northwest of Clarkwood). IPP 52.40 BOPD (net), 40% water, 22°, GOR 175 cu. ft. per barrel, perforations 3,194-3,200 ft. (Oakville). TD 7,500 ft. (Discovery well Rolling Hills-Oakville 5th Sand field.)

Victoria County: Harkins & Co. 1 Schultz, C. W. Vickery Sur., A-342. Absolute open-flow potential 425 M.c.f. daily, dry gas, shut-in TP 626 psi., perforations 1,351-55 ft. (Frio). TD 3,300 ft. (New pay in Meyersville field.)

SOUTHWEST TEXAS

Duval County: Russell Maguire 1-A Atlee Parr, Block 39, Wheeler-Splane Sub., San Andres Grant (5 miles southeast of Benavides). Absolute open-flow potential 32,000 M.c.f. daily, dry gas, shut-in TP 1,136 psi., perforations 2,624-33 ft. (Atlee sand). TD 3,625 ft. (New pay in Good Friday sand.)

Hidalgo County: Bettis & Shepherd 1 Ector Unit, Tract 22-A, Llano Grande Grant. Absolute open-flow potential 10,100 M.c.f. daily, GLR 190 M.c.f. per barrel, 57.3°, shut-in TP 2,842 psi., perforations 7,240-60 ft. (Frio), and 17,000 M.c.f. daily, GLR 112.9 M.c.f. per barrel, 54.8°, shut-in. TP 2,780 psi., perforations 6,810-40 ft. (Frio). TD 7,700 ft. (New pays in Cano-Mexico field.)

Webb County: Miller & Fox 1 Carlos Guerra et al, Survey 711 (12 miles north of Bruni). IPP 31.05 BOPD (net), 3.5% water, 22.8°, perforations 1,313-21 ft. (Cole sand). TD 2,905 ft. (Discovery well Seven-Eleven field).

Zapata County: Frio Production Co. 1 Otto Schroeder, Section 311, Share 3, E. Rosell Sur. (5½ miles southwest of Guerra). Absolute open-flow potential 2,000 M.c.f. per barrel, dry gas, shut-in TP 816 psi., perforations 2,448-53 ft. (Yegua). TD 2,525 ft. (New-field discovery.)

(Continued on page 171)

MILLARD K. NEPTUNE

Pipeliner Has Varied Career

ALTHOUGH Millard K. Neptune will deny it, he is one of the most versatile oil executives in the business.

Now only 47 years old, the senior vice president of Texas Eastern Transmission Corp. has held management jobs in practically every branch of the oil industry. His varied career already has extended over more than a quarter of a century and more than half of the globe.

But, of all his assignments, Neptune considers his present one the most interesting and the most challenging. It may prove also to be the most important to the industry as a whole.

Neptune recently moved from Texas Eastern's Shreveport headquarters to become top man of the company's Little Big Inch division at Houston. The famous defense-inspired 20-in. pipeline was one of the nation's main arteries for movement of petroleum products from the Gulf Coast to the Eastern Seaboard during World War II. It recently was reconverted to products service as far as Lebanon, Ohio, after transmitting natural gas for a decade after the war.

Reconversion of the Little Big Inch gives Gulf Coast refineries a more direct route to inland markets in the Middle West (OGJ, Aug. 25, p. 43).

"It's a logical thing," says Neptune, "and every day brings some little indication of acceptance by the industry and particularly by the principal companies, the major companies."

Neptune emphasizes that Texas Eastern is not entering the marketing business. The company still is primarily concerned with the transmission of natural gas. Although it operates a refinery at Tyler, Tex., the company has no retail marketing outlets.

But, Neptune says, in the field of transporting refined products "we plan to be second to none."

Varied career . . . Neptune was born in Washington, D. C., and grew up in Bartlesville.

He worked for Phillips Petroleum Co. as a pumper and roustabout in Oklahoma City field while attending the University of Oklahoma, where he received degrees in mechanical engineering (1934) and law (1937).

▶▶▶ Personals

Donald N. Mooney, production engineer with Sinclair Oil & Gas Co., has been transferred from Tulsa to Drumright, Okla.

A. L. Thompson, tool pusher with Powell Drilling Co., has been transferred from Ellis, Kans., to Pratt, Kans.

Joseph D. Harnett, vice president of Standard Oil Co. (Ohio), has moved from St. Louis to Cleveland to become assistant to **Samuel H. Elliott,** vice president, marketing. From 1954 to 1957 he served as manager of the transportation department. **Henry W. Pattison,** manager of the transportation department in St. Louis since 1957, will be directly responsible to Sohio's president for the crude and product transportation activities of the company.

Quinton L. Darnell, assistant gas analyst for the gas and gas-products department of Sinclair Oil & Gas Co., has been transferred from Seminole to Drumright, Okla., and promoted to intermediate petroleum engineer.

Paul D. Harryman has joined the research department of Monsanto Chemical Co.'s Lion Oil Co. division at Texas City. Harryman is from Keyes, Okla., and graduated from Oklahoma State University this year with a B.S. degree in petroleum engineering.

Max L. Passante will fill the newly created post of director of foreign operations for Lion Oil Co., division of Monsanto Chemical Co. He will headquarter in Houston. Passante received a doctorate in geology in 1937 and has done oil and exploratory work in various parts of Europe, South America, and the U. S.

James S. Patterson will become manufacturing superintendent for International Petroleum Co., Ltd., at Talara, Peru, September 15. He succeeds **Cornelius F. Burk,** who is retiring after 27 years with International and affiliated companies. Patterson joined International in 1943. Since 1955 he has been assistant refinery manager at Barranca, Colombia.

Preston E. Chaney has been promoted from assistant director to associate director of production research and development for Sun Oil Co. at Richardson, Tex. He has been with Sun since 1938 and was named assistant director in 1955. **Fred M. Mayes** succeeds Chaney as assistant director, and **Jack W. Jones** succeeds Mayes as section head for electrical logging and instrumentation. Both Mayes and Jones joined Sun as physicists in 1945.

After graduating, he continued to work for Phillips as a petroleum engineer.

During World War II he was on loan to the Government as assistant to the director of production for the Petroleum Administration for War in Washington.

After the war he went to Venezuela as assistant manager of the Phillips subsidiary there. Later, he returned to the states and served a short time as assistant manager of West Edmond Hunton Lime unit, north of Oklahoma City.

In 1948 Neptune joined Continental Oil Co. and soon was named manager of its foreign department. During the Korean War, he returned to Washington and served with the Petroleum Administration for Defense.

From 1951 to 1954 Neptune was president of Platte Pipe Line Co., with headquarters in Kansas City, Mo. Then he returned to foreign service, this time as general manager of Egyptian-American Oil Co. (now Sahara Petroleum Co.) in Egypt. In April 1957 he left to join Texas Eastern.

Neptune is married to the former Helen Blythe of Kaufman, Tex. They have two children, Gary, 13, and Susan, 11.

Two of Neptune's three brothers also are in the pipeline business. F. B. (Bud) Neptune is executive vice president of Phillips Pipe Line Co., Bartlesville, and W. E. (Bill) Neptune is assistant to the president of Pipe Line Technologists, Inc., Houston. The other brother, Bob, practices law in Bartlesville.

E. F. Middleton, geologist with Shell Oil Co., has been transferred from Franklin to Lafayette, La. The move was a result of the merger of Shell's Franklin and Lake Charles division offices into a new Lafayette division office.

James Neill Fuquay is now chief engineer for Sun Pipe Line Co.'s crude-lines department at Beaumont, Tex. He replaces **J. B. Turner,** who recently transferred to Venezuela Sun Oil Co. Prior to his promotion, Fuquay had been assistant chief engineer at Beaumont since April 1956. He began his career with Sun as a civil engineer in 1948. The company also announces appointment of **Edgar Miller, Jr.,** and **Wallace A. Robinson** to the newly created positions of senior engineer in the Beaumont office. Miller was formerly assistant chief gager, and Robinson was mechanical engineer.

W. T. Thagard, manager of Texas Eastern Transmission Corp.'s coordinating and planning department, is now headquartered in Houston. His office was formerly in Shreveport.

Robert N. Mullin has joined Sumner Sollitt Co., Chicago, as director of petroleum industry activities. He recently retired as division general manager for Gulf Oil Corp.

Oscar John Dorwin, formerly vice president and general counsel for The Texas Co., has been elected senior vice president. He continues as general counsel. **Marion J. Epley, Jr.,** assistant to the chairman, has been elected a vice president. **Kerryn King,** formerly general manager of the industrial and public-relations department, is now vice president in charge of that department.

C. U. Daniels has retired as chairman of the board of Royalite Oil Co., Ltd., Calgary. He will take up permanent residence near Fort Worth. Daniels, who joined Royalite as president and managing director in 1950, has been chairman since 1955. He began his career in Oklahoma with Gulf Pipe Line Co. 46 years ago and since then has been active in the industry in the U. S., South America, and Canada. His community and oil-industry activity has included a term as president of the Calgary Chamber of Commerce in 1957 and past chairman of the central board of governors of the Canadian Petroleum Association.

H. K. McKinnon has been named manager of Shell Oil Co.'s newly consolidated production unit, which combines the East Texas and Houston divisions with headquarters in Houston. McKinnon has been serving as East Texas division production manager at Kilgore. **J. W. Moore,** present Houston division production manager, will become production superintendent on the Houston area staff. **R. L. Walker,** who is now East Texas division mechanical engineer, will be production superintendent at Kilgore. **C. H. Taylor** will continue as Houston division production superintendent. Shell officials pointed out that Kilgore will continue as a district-production office with supervision of the company's East Texas operations. Reassignment of personnel under the new arrangement will be gradual, extending over a 2 to 3-year period.

▶▶▶ Personals

TAYLOR

Vernon Taylor, who was manager of Imperial Oil's producing operations in western Canada, has been appointed a director of the company. **W. D. C. Mackenzie** has resigned as a director for personal reasons and has returned to Calgary as manager of western producing operations. Taylor, who started with Imperial in 1937 as a petroleum engineer, became operations manager of the western producing division in 1945 and held that position when the famous Leduc field was discovered in 1947 (OGJ, Apr. 7, p. 263). He was appointed western regional manager at Calgary in 1955.

James Edward Smith has joined the Texas Railroad Commission's District 7-B office in Abilene as an engineer. He graduated from Texas A. & M. College last month.

W. J. Nowlan will be district landman in Ohio Oil Co.'s newly formed district at Anchorage, Alaska. He is being transferred from Salt Lake City where he was district landman. **E. O. Larson,** landman at Casper, will replace Nowlan at Salt Lake City.

Bob Franklin has joined Warren-Bradshaw Exploration Co. as special representative of the drilling department in the West Texas-New Mexico and Four Corners areas. Franklin, who lives in Midland, Tex., recently served as general superintendent and contract representative for Westlund Drilling Co. Prior to that he was associated with Sharp Drilling Co. for several years.

S. T. Duree, Houston, has retired after more than 40 years in Cities Service Oil Co.'s production division. Upon his retirement the company's South Texas production operations were consolidated under supervision of **D. S. Bodie,** Columbus, Tex. Operational headquarters for the consolidated district will be in the Cities Service Building at Columbus. Assisting Bodie at Columbus are **H. C. Baumler,** district engineer, and **C. D. Robertson,** district clerk.

Personals

Walter G. Ainsley will be in charge of the new Detroit research office set up by Sinclair Research Laboratories, Inc., to maintain a closer research liaison with the automotive industry. Prior to his new assignment, Ainsley was Sinclair's director of engine laboratories, a division of Sinclair Research at Harvey, Ill. His new duties will include keeping abreast of automotive industry engineering and studying new engine developments as they relate to fuel and lubricants.

James F. Campbell has been named manager of Esso Standard Oil Co. (Chile), S.A.C. He succeeds **Peter J. Kinnear,** who was transferred to Argentina. Prior to his new appointment, Campbell was Esso Standard's regional manager for the Caribbean area with headquarters in Havana.

Robert I. Bradley, independent consulting engineer, will take on additional duties on a part-time basis as an assistant professor in the petroleum production department at the University of Tulsa. He will teach economics and evaluation, petroleum development engineering, and natural-gas laboratory. Bradley, who will continue his consulting work, has been in petroleum production engineering the past 25 years.

Edward A. Hamilton, formerly with Carter Oil Co., is the new geologist for Dee Drilling Co., Mount Carmel, Ill.

Neville B. Dortch, driller with Henry Black Drilling Co., Inc., has been transferred from Seminole, Tex., to Andrews, Tex.

William R. Kelly, assistant division manager of Sinclair Refining Co., Fort Worth, has been promoted to manager of the Rocky Mountain division, Denver. He succeeds **D. R. McCallum** who has moved to Fort Worth as assistant to the manager of Sinclair's southwestern division.

L. E. Brock has been appointed assistant to the production superintendent at Pan American Petroleum Corp.'s North Texas - New Mexico division in Fort Worth. Prior to his new appointment he served as unitization superintendent in Pan Am's general office in Tulsa. He has served in various capacities with the company, including engineering positions at Pampa and Fort Worth and senior engineer at Tulsa.

Garry Owen, vice president of concession affairs for Arabian American Oil Co., has left Saudi Arabia for Washington, D. C., where he will be vice president, government relations. He replaces **James Terry Duce,** who is retiring (OGJ, Jan. 27, p. 396).

J. R. Fleming has joined the Athens, Greece, office of George Armistead & Co., as assistant manager. The Armistead company is the technical adviser to the Greek Government in connection with the recently built 30,000-bbl. refinery at Aspropyrgos. Fleming will work in process engineering at the new refinery. He was formerly chief process engineer for Neches Butane Products Co. at Port Neches, Tex.

J. Eugene Stones, geophysicist with Superior Oil Co., has been transferred from Oklahoma City to Midland, Tex.

Eldon A. Siegman will become senior financial analyst in the financial and planning division, controller's department, American Oil Co., New York. Siegman, who joined the company's research and development department as a chemical engineer in 1946, is now serving as section head in process design.

T. J. Williams has been promoted to the newly created position of operations manager for Leonard Refineries, Inc., with headquarters at Alma, Mich. He will be responsible for all refinery operations at the three Leonard refineries. Prior to the promotion, Williams was refinery manager of the company's Roosevelt oil and refining division at Mount Pleasant, Mich. **Charles Fiske,** technical director, succeeds Williams at Mount Pleasant.

Deaths

A. W. Peake, 68, retired president of Standard Oil Co. (Ind.), died August 28 while vacationing at Dundee, Scotland. He had been ill about a week. Born in Kansas City, he attended Stanford University and graduated with an A.B. degree in mining and geology in 1912. He started in the oil industry as a roustabout in California. In 1916 he moved to Wyoming where he joined Midwest Refining Co., which later was purchased by Indiana Standard. In 1928, Peake was named president of Dixie Oil Co., a producing subsidiary of Indiana Standard. In 1930 he moved to Chicago as a director and vice president in charge of the parent company's new production department. He was president of Indiana Standard from 1945 until his retirement in 1955.

Charles D. Wagner, Balboa, Calif., died August 26. He was retired president of Wagner-Morehouse, Inc., Los Angeles, manufacturers of oil-well equipment. He was 71 years old. Wagner entered the oil industry prior to 1920. He helped form Emsco Derrick & Equipment Co. in 1926 and served as vice president and manager of sales the next 10 years. In 1936 he organized Wagner Sales & Service Co. Later he was joined by Harry C. Morehouse, and Wagner - Morehouse was formed. He was president of that company until his retirement in 1956.

Richard A. Bramkamp, 48, chief geologist of Arabian American Oil Co., died September 1 in New York. He was one of the pioneer geologists in Saudi Arabia and played a major part in Aramco's discovery of oil there.

D. S. Fletcher, 65, president of Fletcher Oil Co., Wilmington, Calif., died at his home August 28 after an illness of several months. Fletcher was born in Idaho and started in the oil business when he was 21. Fletcher Oil is a marketing and refining firm with a 9,000-bbl. plant at Wilmington.

Walter C. Monroe, 60, president and editor of California Oil World, died August 25 at his home in Los Angeles. He was a native of Indiana and moved to California as a small boy.

Hugh H. Heinig, 68, independent producer in Detroit, died recently.

Herbert E. Moore, 63, senior accountant for The Texas Co., died August 25 at Los Angeles.

Between-seasons blues hit marketers

BY BILL BACHMAN
District Editor

OIL MARKETERS are entering the uneasy period of in-between seasons when weather can unduly influence their demand picture. What the industry now needs is a few weeks of dry, chilly weather.

Dry days, the marketers reason, would encourage motorists to take more week-end trips in the fall and would allow road builders to complete their programs before frost. In both cases, the season of good gasoline, asphalt, and road-oil demand would be extended a while.

Chilly nights would persuade householders they need to lay in a supply of heating oil immediately and not wait until snow flies to contact their dealers.

This wishful thinking stems from what's happening in the market:

... **Gasoline demand** is easing off after the Labor Day spree which marked the end of the motoring season.

... **Demand for heating oils** is still lagging because start of the heating season is still weeks away.

The realities . . . The motoring season closed out with a good Labor Day demand for gasoline.

Resorts areas reported heavy patronage. Most points also reported heavy highway traffic. The weather cooperated for several days ahead of the long holiday. This explains the strong demand prior to the holiday for gasoline from jobbers and distributors. A cleanup market may persist for a short time yet. But all refiners know their big demand for gasoline is over until next spring. The late spurt only helps them cut down burdensome stocks.

This is reflected in a rather soft gasoline market. General price slashing hasn't started. A few sales involving small volumes have been completed in the Mid-Continent area at 11½ cents for regular, about ½ cent under published prices. Brokers are finding it difficult to find takers for spot sales at any higher quotations.

Some sellers who can draw on river terminals can shave this price, but refiners generally in the Mid-Continent are striving to hold the line on their prices, despite sagging markets on the coasts.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,850,925	DOWN	20,125	UP	89,650
Crude stocks	251,041,000	UP	1,003,000	DOWN	36,637,000
Completions	861	DOWN	112	DOWN	235
Refinery runs	7,937,000	UP	45,000	DOWN	390,000
Gasoline stocks	173,470,000	DOWN	286,000	UP	1,787,000
Kerosine stocks	28,624,000	UP	1,076,000	DOWN	5,490,000
Distillate stocks	138,322,000	UP	5,924,000	DOWN	16,554,000
Residual stocks	67,018,000	UP	24,000	UP	14,546,000
Four-product stocks	407,434,000	UP	6,738,000	DOWN	5,711,000
Total imports	1,553,400	UP	112,400	UP	95,900

The distillate market, which saw a slight price advance last month, still has not been tested. Distillate buying hasn't started yet on any large scale. Sellers so far, however, are finding it difficult to get more than 8⅝ to 8¾ cents per gallon for spot sales of No. 2. Only a few sales have been reported in the Mid-Continent area at around these prices. They were made by jobbers who had specialized use for the distillate or who wanted to take advantage of the lull before the market rush.

Refiners are reluctant to shave the distillate prices yet. All signs point to a good distillate market this winter. Stocks still are relatively low. A hard winter conceivably could put the fuel in short supply and make prices firm to rising throughout the season. As refiners see it, the sooner the cold weather comes the better.

Good signs . . . Marketers read good news into announcements of many refiners that they are cutting crude runs and shifting yields.

The market men regard this type of positive action as direly needed to save the gasoline market and prepare for winter distillate demand. They say refiners can't do anything about the weather's effect on demand but can do something about supply.

Only a few refiners so far have announced plans to cut back runs and shift yields to get less gasoline and more distillates. But the moves represent a trend which marketers feel will continue throughout the industry. With gasoline stocks still about 2 million barrels above a year ago and distillate stocks about 17 million barrels below, refiners really have no other choice, they say.

The crude picture . . . Two major crude buyers have followed competitors in lowering Louisiana crude prices.

Esso Standard Oil Co. reduced its postings 5 to 10 cents a barrel in South and Central Louisiana, averaging about 6½ cents a barrel for the 89,000 bbl. daily involved. Esso cited competitive prices as the reason for the cut.

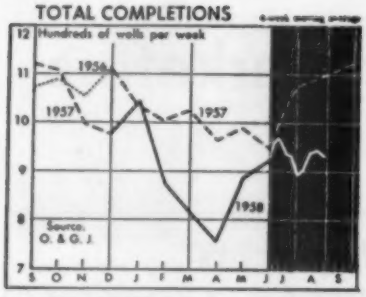
Esso's average posting now will be about $3.30 per bbl. for 40°-gravity South Louisiana crude and $3.40 in Central Louisiana.

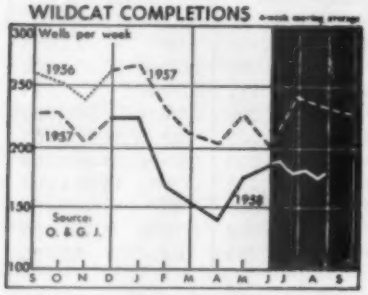
Magnolia Petroleum Co. also cut its prices 15 cents a barrel for Louisiana coastal crude. New top posting is $3.30 a barrel for 40°-gravity crude.

Magnolia also extended its 2-cent per degree price penalty for the higher-gravity crudes to all areas where the company buys. Effective date was September 1.

The cuts in Louisiana apparently are still a part of the general readjustment of prices which has been going on for days in the coastal regions of Texas and Louisiana. Most buyers regarded previous premium prices as too high to justify in relation to competitive crudes from other areas. The prices generally still are equal to or above the levels established by the 1957 increases.

DRILLING





Active Rotary Rigs*

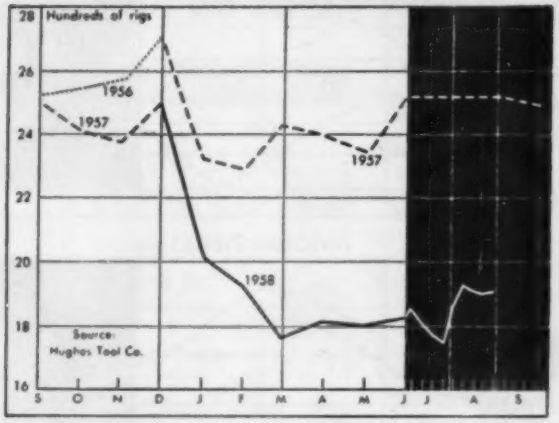
	9-1-58	8-25-58	9-2-57
Alabama	5	6	3
Arkansas	23	25	27
Arizona	3	2	....
California	67	73	98
Colorado	50	38	65
Florida	1	1	1
Georgia	....	....	....
Idaho	....	....	....
Illinois	62	59	58
Indiana	12	10	7
Iowa	3	3	2
Kansas	159	159	153
Kentucky	5	6	12
Louisiana	302	273	439
North	34	32	64
South	233	225	272
Offshore	35	36	103
Maryland	....	....	1
Michigan	10	10	15
Missouri	1	1	....
Montana	19	20	23
Mississippi	40	41	43
Nebraska	21	23	36
Nevada	....	....	....
New Mexico	103	104	164
New York	2	2	....
North Dakota	29	27	37
Ohio	....	....	....
Oklahoma	191	209	243
Oregon	....	....	1
Pennsylvania	9	10	14
South Dakota	3	3	....
Texas	701	669	923
Gulf Coast	136	137	195
Offshore	....	....	3
N. & E. Texas	167	(†)	(†)
W. Cen. Texas	220	(†)	(†)
West Texas	178	(†)	(†)
Tennessee	....	....	1
Utah	22	31	66
Washington	1	1	1
West Virginia	4	6	4
Wyoming	63	62	73
Virginia	....	....	1
Total U. S.	1,911	1,894	2,511
Western Canada	152	157	192
Eastern Canada	4	2	3
Grand total	2,067	2,053	2,706

*Hughes Tool Co. †Comparisons not available due to change in method of reporting. See page 80.

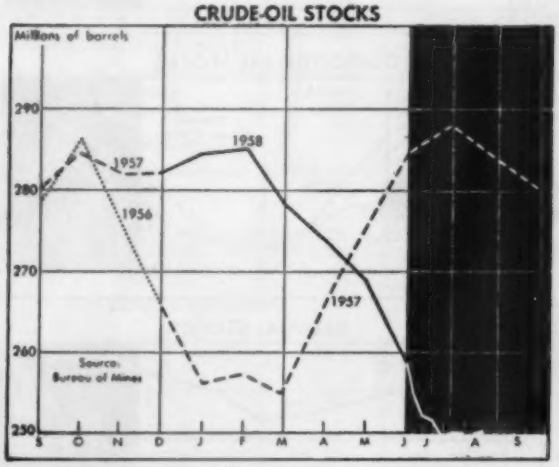
WEEKLY WELL COMPLETIONS . . . WEEK ENDED AUGUST 30, 1958

	Total wells							Cumulative		Total wildcats					Cumulative	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1958	1957	Total	Crude	Cond.	Gas	Dry	1958	1957
Alabama	2	1	0	0	1	0	13,206	50	62	1	0	0	0	1	19	20
Arkansas	16	10	0	1	5	0	44,253	478	725	1	0	0	0	1	110	131
California	28	18	0	0	10	0	165,903	1,079	1,432	9	1	0	0	8	248	356
Colorado	24	4	0	1	19	0	105,965	534	561	14	0	0	0	14	308	381
Illinois	44	15	0	2	27	0	90,596	1,402	1,706	13	1	0	0	12	276	435
Indiana	16	2	0	0	13	1	24,396	489	425	6	0	0	0	6	180	84
Kansas	62	21	0	2	39	0	220,032	2,469	2,805	20	1	0	0	19	533	563
Kentucky	34	6	0	6	21	1	56,339	744	959	3	0	0	0	3	85	191
Louisiana	71	24	10	3	34	0	537,125	2,260	2,501	16	0	0	0	16	332	445
North	27	8	0	3	16	0	105,377	811	887	10	0	0	0	10	136	117
South	32	14	2	0	16	0	311,346	1,147	1,151	6	0	0	0	6	177	270
Offshore	12	2	8	0	2	0	120,402	302	463	0	0	0	0	0	19	58
Michigan	6	2	0	2	2	0	11,605	276	276	1	0	0	0	1	91	101
Mississippi	4	2	1	0	1	0	31,239	256	252	1	0	0	0	1	119	135
Montana	4	2	0	0	2	0	17,164	217	269	1	0	0	0	1	91	96
Nebraska	22	9	0	0	13	0	136,343	463	590	6	0	0	0	6	216	325
New Mexico	31	17	0	9	5	0	172,502	1,313	1,410	5	1	0	0	4	172	190
West	13	5	0	7	1	0	66,223	634	569	1	1	0	0	0	74	72
East	18	12	0	2	4	0	106,279	679	841	4	0	0	0	4	98	118
New York	0	0	0	0	0	0	0	393	306	0	0	0	0	0	32	4
North Dakota	5	3	0	0	2	0	37,301	297	176	2	0	0	0	2	97	76
Ohio	39	18	0	14	6	1	114,677	708	743	2	0	0	1	1	11	9
Oklahoma	95	42	0	4	43	6	276,409	4,205	4,162	14	0	0	0	14	583	474
Pennsylvania	0	0	0	0	0	0	0	418	442	0	0	0	0	0	9	39
Texas	328	179	13	17	116	3	1,364,148	11,810	14,548	82	13	4	2	63	2,405	3,560
Dist. 1	10	4	0	0	6	0	28,507	638	832	5	0	0	0	5	257	291
Dist. 2	11	3	0	2	5	1	68,816	499	512	3	0	0	0	3	131	194
Dist. 3	21	4	2	2	13	0	139,265	847	1,162	10	1	2	1	6	191	337
Dist. 4	15	4	3	1	7	0	111,499	782	941	5	0	0	0	5	227	317
East	31	17	2	0	12	0	143,120	811	865	8	1	1	0	6	224	252
Dist. 7-B	44	21	1	0	22	0	122,431	1,582	1,899	15	3	1	0	11	445	677
West	96	72	3	1	20	0	441,625	3,429	4,136	18	6	0	1	11	479	597
Dist. 9	68	37	1	2	26	2	192,101	2,385	3,234	17	2	0	0	15	385	823
Dist. 10	32	17	1	9	5	0	116,784	837	967	1	0	0	0	1	66	72
Utah	2	2	0	0	0	0	11,287	264	136	0	0	0	0	0	56	74
West Virginia	19	4	0	9	6	0	52,214	477	425	0	0	0	0	0	12	20
Wyoming	9	2	0	0	7	0	39,905	476	568	4	0	0	0	4	138	194
Miscellaneous	0	0	0	0	0	0	0	63	68	0	0	0	0	0	54	51
Total U. S.	**861**	383	24	70	372	12	3,522,609	31,141	35,547	**201**	17	4	3	177	6,177	7,954
Prev. week	937	470	25	64	338	40	3,604,301	.....	.....	158	10	3	7	138	.....	.....
Cum. 1958	31,141	15,296	767	2,373	11,912	793	129,561,438	.....	.....	6,177	607	106	185	5,279	.....	.....
Western Canada	50	33	0	3	12	2	241,123	1,607	2,047	8	0	0	0	8	436	580

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	8-23-58	8-16-58	8-24-57
Pennsylvania	2,948	2,874	3,241
Other Appalachian	1,408	1,469	1,599
Illinois, Indiana, Michigan	11,334	10,986	11,451
Nebraska and North Dakota	2,218	2,046	2,491
Kansas	9,442	9,722	11,097
Oklahoma	15,947	15,574	22,085
Arkansas	1,705	1,880	2,766
Louisiana	16,668	16,636	19,350
North	2,964	2,898	3,148
South	13,704	13,738	16,202
Mississippi, Alabama, Florida	2,539	2,427	2,445
New Mexico	7,853	7,081	9,773
Texas	102,880	102,458	130,581
East Texas	7,713	8,211	10,482
West Texas	50,678	49,311	62,730
Texas Gulf	18,072	18,770	24,564
Other Texas	26,417	26,166	32,805
Wyoming	13,793	13,738	17,445
Other Rocky Mountain	9,305	9,861	6,360
California	36,323	36,789	30,124
Foreign	†16,678	16,497	16,870
Total	**251,041**	250,038	287,678

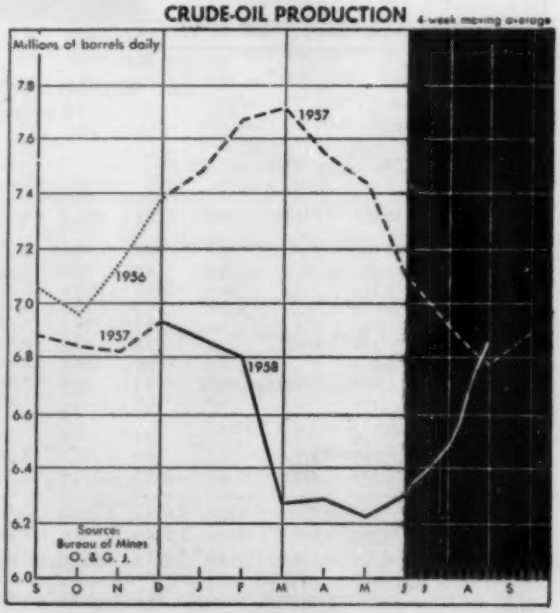
*Bureau of Mines. †Includes 5,433,000 bbl. in California.

DAILY AVERAGE PRODUCTION FOR WEEK

	August 30, 1958			August 23
	Crude oil	Lease condensate	Total	total
Alabama	17,150		17,150	17,075
Arkansas	73,150	200	73,350	74,800
California	855,800		855,800	852,100
Colorado	131,400		131,400	131,800
Eastern	46,700		46,700	47,300
Florida	1,275		1,275	1,275
Illinois	216,400		216,400	220,600
Indiana	32,400		32,400	31,700
Kansas	†338,250		†338,250	†335,050
Kentucky	40,800		40,800	41,100
Louisiana	765,850	81,925	847,775	847,725
North	106,350	2,400	108,750	108,700
South	659,500	79,525	739,025	739,025
Michigan	24,300		24,300	25,200
Mississippi	96,600	3,950	100,550	100,550
Montana	77,300		77,300	78,400
Nebraska	59,200		59,200	57,400
Nevada	100		100	100
New Mexico	272,400	5,000	277,400	277,400
North Dakota	36,400		36,400	36,200
Oklahoma	†562,400		†562,400	†573,400
Texas	2,627,000	62,100	2,689,100	2,689,100
Dist. 1	45,000	400	45,400	45,400
Dist. 2	116,000	8,200	124,200	124,200
Dist. 3	345,000	31,000	376,000	376,000
Dist. 4	192,000	8,000	200,000	200,000
Dist. 5	32,000	275	32,275	32,275
Dist. 6	117,000	6,000	123,000	123,000
East Texas field	153,000		153,000	153,000
Dist. 7-B	142,000	75	142,075	142,075
Dist. 7-C	131,000	4,050	135,050	135,050
Dist. 8	1,045,000	1,800	1,046,800	1,046,800
Dist. 9	204,000	1,500	205,500	205,500
Dist. 10	105,000	800	105,800	105,800
Utah	96,900		96,900	105,600
Wyoming	325,800		325,800	327,000
Others	‡175		‡175	‡175
Total U. S.	6,697,750	153,175	**6,850,925**	6,871,050
Change from prev. week			**20,125**	
Canada	†455,500		†455,500	†473,800
Total U. S. Prod.—Jan. 1-Aug. 30			1,574,711,425 bbl.	
Same period last year (crude plus cond.)			*1,772,122,664 bbl.	

*Includes 33,943,925 bbl. condensate. †Week ended previous Monday. ‡South Dakota and Washington.

CRUDE-OIL PRODUCTION 4-week moving average



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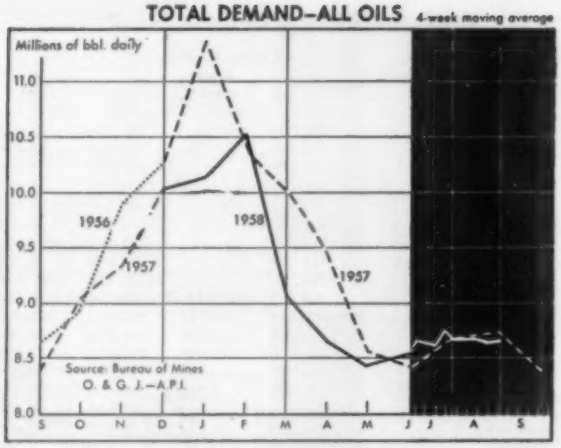
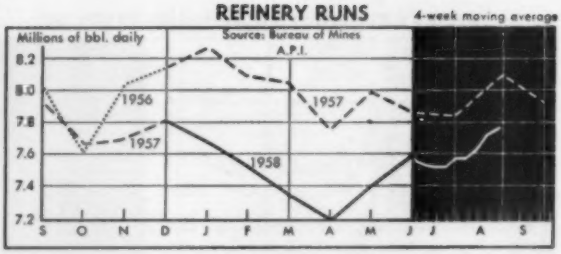
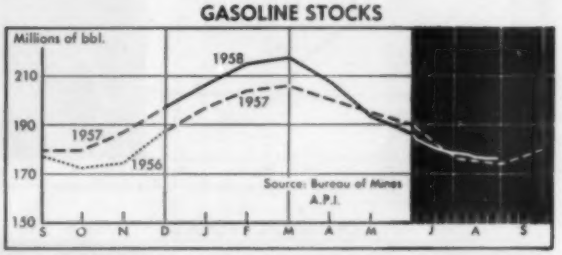
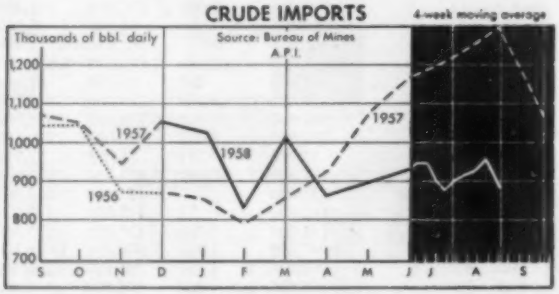
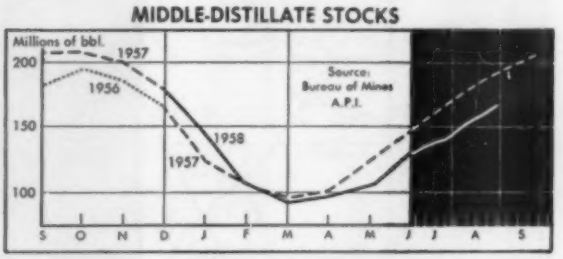
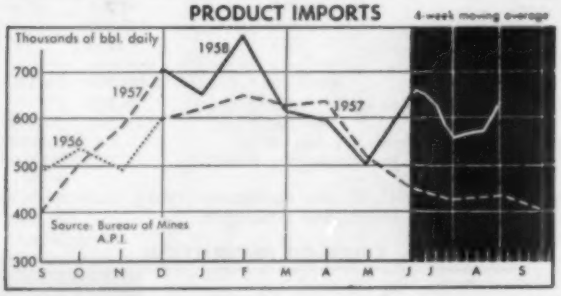


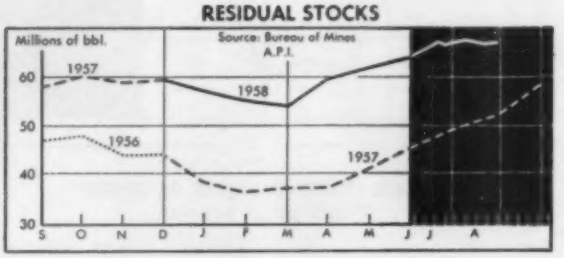












API REFINERY REPORT—AUGUST 29, 1958

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, August 1957 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist	Resid.
East Coast	1,153	548.6	21.4	272.9	187.3	40,335	10,430	46,748	12,982	1,283	530.9	22.0	334.6	237.7
Appalachian:														
District 1	99	45.3	1.7	21.4	6.1	4,373	547	3,126	338	98	44.7	3.4	21.9	5.4
District 2	107	58.4	4.9	18.0	9.6	2,365	494	1,375	284	68	37.0	2.3	10.3	8.1
Ind., Ill., Ky.	1,352	710.6	58.0	287.8	119.8	32,764	7,200	24,692	5,619	1,332	694.9	52.2	263.3	135.8
Minn., Wis., Dak.	108	55.1	1.6	32.3	9.3	6,684	1,498	7,452	558	105	50.1	7.5	26.7	8.1
Okla., Kans., Mo.	740	429.4	11.0	184.1	24.6	17,129	1,756	12,933	978	744	419.0	14.7	165.0	28.2
Inland Texas	279	196.7	7.7	53.3	19.1	6,276	364	2,042	1,976	286	210.6	8.0	52.8	21.3
Texas Gulf Coast	1,839	952.1	116.6	444.9	203.3	21,433	2,770	14,665	8,410	1,917	990.5	92.7	505.2	231.2
La. Gulf Coast	679	371.6	47.0	157.1	51.4	9,017	1,970	5,889	1,531	656	358.3	33.6	168.1	45.4
N. La. and Ark.	104	36.6	6.9	21.9	5.3	4,680	946	2,269	181	91	32.2	5.3	19.2	6.8
Rocky Mountain:														
New Mexico	19	13.6	...	3.4	0.9	395	8	117	40	28	14.9	0.3	4.2	3.7
Other Rocky Mt.	282	131.4	4.7	56.9	32.3	4,727	292	2,982	920	292	141.3	4.2	63.2	36.6
West Coast	1,176	480.0	1.1	145.3	371.9	23,292	349	14,032	33,201	1,192	517.1	5.5	170.6	320.5
August 29, 1958	7,937	4,029.4	282.6	1,699.3	1,040.9	173,470	28,624	138,322	67,018	8,092	4,041.5	251.7	1,805.8	1,088.8
August 22, 1958	7,892	4,000.7	255.9	1,714.9	958.6	173,756	27,548	132,398	66,994	.....	.....	.....	.....	.....
August 30, 1957	8,327	4,073.7	267.3	1,891.6	1,087.0	171,683	34,114	154,876	52,472	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (89 octane)	11.75-12.25
Premium (99 octane)	14.75-15.25
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	10.75
Regular (92 octane)	11.00
Premium (97 octane)	12.00-12.125
Premium (98 octane)	12.125-12.25
California (rack) (Los Angeles):	
Regular (88 octane)	11.3-11.5
Premium (96 octane)	12.8-13.0
Premium (98 octane)	13.3-13.5
Caribbean area (cargoes):	
Regular (87 octane)	10.375
Premium (97 octane)	12.125

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.5
Breckenridge:	
Grade 26-70	4.0

*If 26-70 natural is considered as 100%, prices for lower-vapor-pressure grades increase 2.5% for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.75-10.00
Diesel oil (58 d.i. and above)	9.50-9.75
Distillate No. 1	9.50-9.75
Distillate No. 2	8.75-9.00
Gulf Coast (cargoes):	
Kerosine 41-43	8.875
Distillate No. 2	8.625
New York Harbor (barges):	
Kerosine 41-43	9.95
Distillate No. 2	9.45
Diesel fuel, 48-52 d.i.	10.05
Caribbean area (cargoes):	
Distillate No. 2	8.625

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank car	6.50
New York (export):	
126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.30-1.35
Gulf Coast (cargoes):	
Bunker C fuel	$2.20-2.25
New York Harbor (barges):	
Bunker C fuel	$2.57
Caribbean (cargoes):	
Bunker C	$2.25
California (rack):	
Bunker C fuel, Los Angeles	$2.45

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	23.0
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	20.5
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	22
200 vis. neutral (180° at 100°), 25 p.t.	21

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.§	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.36	....	....	....	....
15-15.9	2.41	....	....	....	$1.81
16-16.9	2.46	....	....	....	1.86
17-17.9	2.51	....	....	....	1.91
18-18.9	2.57	....	....	....	1.96
19-19.9	2.62	....	....	....	2.01
20-20.9	2.68	$2.75	....	$2.62	2.06
21-21.9	2.73	2.77	....	2.64	2.11
22-22.9	2.78	2.79	....	2.66	2.16
23-23.9	2.84	2.81	$3.44	2.68	2.21
24-24.9	2.89	2.83	3.46	2.70	2.26
25-25.9	2.95	2.85	3.48	2.72	2.31
26-26.9	3.00	2.87	3.50	2.74	2.36
27-27.9	3.06	2.89	3.52	2.76	2.49
28-28.9	3.11	2.91	3.54	2.78	2.54
29-29.9	3.16	2.93	3.56	2.80	2.59
30-30.9	3.22	2.95	....	2.82	2.63
31-31.9	3.27	2.97	....	2.84	2.67
32-32.9	3.33	2.99	....	2.86	2.71
33-33.9	3.38	3.01	....	2.88	2.75
34-34.9	3.44	3.03	....	2.90	2.79
35-35.9	....	3.05	....	2.92	2.83
36-36.9	....	3.07	....	2.94	2.87
37-37.9	....	3.09	....	2.96	2.89
38-38.9	....	3.11	....	2.98	2.91
39-39.9	....	3.13	....	3.00	2.93
40-44.9	....	3.15	....	3.02	2.95

*Includes Oklahoma (sweet), part of Kansas, North Dakota, West Texas (sweet). †Low cold test crude. ‡Sour. §Some postings 3-11 cents lower.

Effective dates of broad changes: California, 6-22-58; east of California, January 3-10, 1957; Pennsylvania Grade, 6-18-58.

FLAT PRICES

Louisiana:	
Sweet Lake	$3.00
Ville Platte	3.30
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	3.90
Middle District	3.72
Southwest Pennsylvania	3.43
West Virginia	3.25
Buckeye Grade	3.25
Illinois Basin	3.00
Canada:	
Leduc-Woodbend	2.67
Redwater (Alta.)	2.56
Smiley (Sask.)	2.33
Pembina	2.52

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 41°-41.9°, Puerto La Cruz	3.34
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26°-26.9°, Amuay*	2.55
Quiriquire, 16.0°-16.4°, Caripito	2.30
Lagunillas heavy, flat, Amuay or Las Piedras*	2.25
Bachaquero, flat, 15°-16°, Las Piedras*	2.08

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$2.12
Iranian, 34.0°-34.9°, Bandar Masur	2.04
Iranian, 34.0°-34.9°, Abadan	1.99
Iraq, 35.0°-35.9°, Fao	1.98
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.85
Qatar, 41.0°-41.9°, Umm Said	2.23
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.49
Iraq, 36.0°-36.9°, Tripoli, Banias	2.49
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.75

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

★ Gulf-U.S.N.H., dirty (USMC—10%)	$2.57
★ P.G.-U.K., dirty (Scale—58%), (22s. 9d.)	3.19
P.G.-U.S.N.H., dirty (USMC—60%)	4.08
Carib.-U.S.N.H., dirty (USMC—47.5%)	1.42

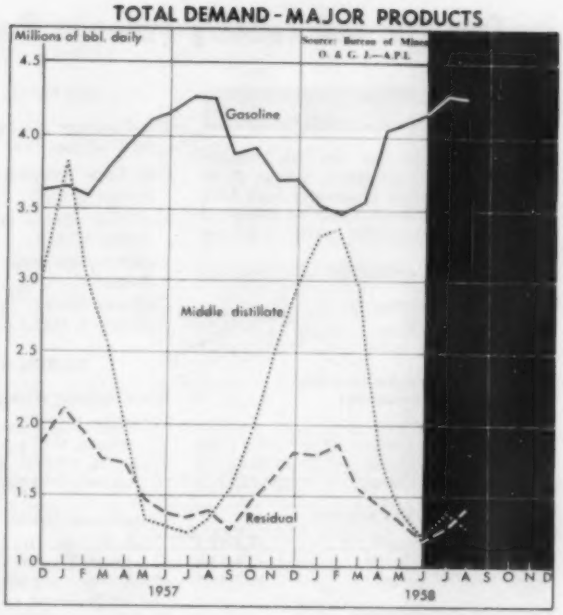
SELECTED MONTHLY DATA

SUPPLY AND DEMAND—MAJOR PRODUCTS
(Thousands of barrels daily)

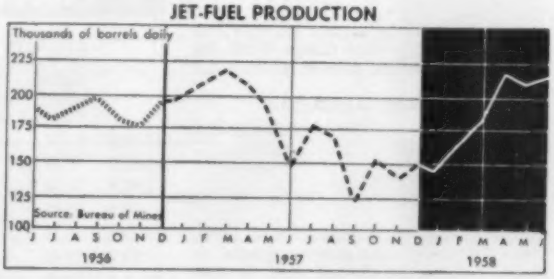
	Total demand	Refinery production	Stocks end of period†
GASOLINE			
August 1958*	4,260	3,980	173,000
July 1958*	4,300	4,005	178,700
June 1958	4,153	3,853	186,276
September 1957	3,897	4,062	180,688
August 1957	4,262	4,042	174,031
KEROSINE			
August 1958*	165	260	28,900
July 1958*	184	239	25,900
June 1958	143	233	24,167
September 1957	220	276	36,382
August 1957	164	252	34,576
DISTILLATE			
August 1958*	1,120	1,690	140,000
July 1958*	1,210	1,657	120,400
June 1958	1,057	1,611	105,311
September 1957	1,334	1,772	173,269
August 1957	1,175	1,806	159,124
RESIDUAL			
August 1958*	1,410	985	67,100
July 1958*	1,275	991	66,900
June 1958	1,186	912	63,864
September 1957	1,269	1,100	58,727
August 1957	1,399	1,089	52,645

*Preliminary. †Thousands of barrels.

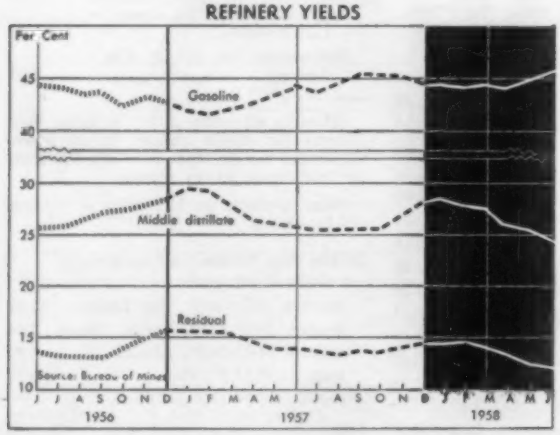
TOTAL DEMAND - MAJOR PRODUCTS



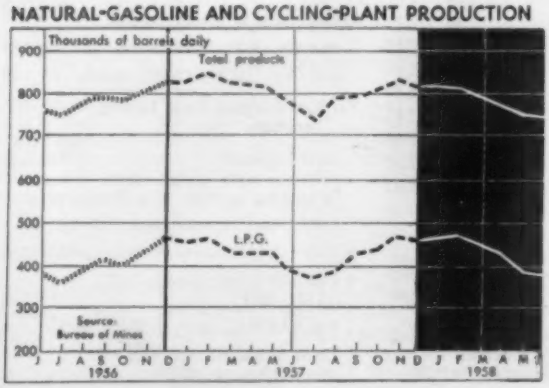
JET-FUEL PRODUCTION



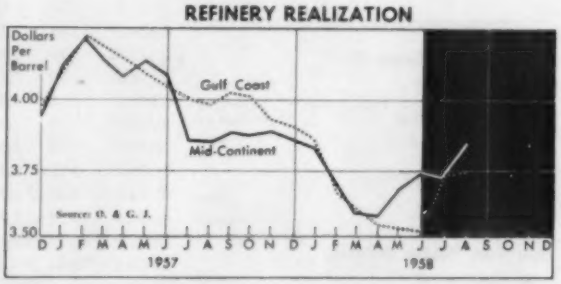
REFINERY YIELDS



NATURAL-GASOLINE AND CYCLING-PLANT PRODUCTION



REFINERY REALIZATION



REFINERY REALIZATION

	August* 1958	July* 1958	June 1958	August 1957
Mid-Continent	$3.85	$3.73	$3.74	$3.86
Gulf Coast	3.75	3.75	3.54	3.99

*Preliminary.

Refinery realization is based on yields of major products and average spot prices of regular gasoline, kerosine, No. 2 fuel, and residual as published in The Oil and Gas Journal.

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12,000'	12¾" OD	.250	"	33.23#
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1—8" x 14" Ser. #12489, Class C5A14, Suction 200#, Discharge 500# Ga.
1—8" x 14" Part #C52-14-DK, Class C5A, Ser. #12488. (Cylinder Liner).
1—8" Piston, Part #CA-24EK for Cooper-Bessemer, Class C5A.
2—23½" x 14" Ser. #4730 and 4731, Class CE14, Suction 0#, Discharge 40#.
1—NEW 7¾" x 20" Ser. #19878, Class CA20, Suction 50#, Discharge 193.6#.
1—19½" x 20" Ser. #6240, Class D-20, 75# W.P.
3—23" x 15" LTC WORTHINGTON COMPRESSOR CYLINDERS, 75# WP.
2—14" x 36" SNOW COMPRESSOR CYLINDERS, 325# W.P.

NEW INTERCOOLING COILS

4—Young Model 440 ARY-53, 150# W.P., 3 Row, 2 Pass Gas Intercooling Coils.
6—Young Model 440 ACY-73, 500# W.P., 3 Row, 2 Pass Gas Intercooling Coils.
NEW CASING—35,000' of 5½" OD 14# J-55 ST&C.
25,000' of 5½" OD 17# J-55 LT&C.
33,000' of ⅝" x 25' Jones, Type 2 Sucker Rods with ⅞ API DP with H&G Couplings priced $31.00 per 100 feet f.o.b. Waskom, Texas.
NEW—Valves, Fittings, Boiler Tubes, Bolts, etc.
USED—Towers, Absorbers, Pumps, Motors.
Reconditioned Guiberson Packers, 4½" x 2⅜" O.D., Type AF

Your inspection is invited

ARKANSAS LOUISIANA GAS COMPANY
Attn.: Purchasing Agent, P. O. Box 1734,
Shreveport, Louisiana—Phone 2-2141

10,000' 4" OD 14# Grade ER2 Drill Pipe—Magnetically inspected #2 Grade—Hughes welded tool joints API full hole, square shoulder 5⅛" to 5½" OD. Atlas Pipe Inc. Box 2368, Corpus Christi, Texas. Phone TU 4-6371.

2—LUFKIN C228D-74-23 PUMPING UNITS, 27" sub-base, portable base, complete with Waukesha #6MZAU engine with starter, slightly used. Located Eastern Louisiana. Eugene E. Kincaid, 412 W. Locust St., Tyler, Texas. Telephone LY 2-8131.

NATURAL GAS desulphurization plant and six and one-half miles of 3½" welded high pressure line, on top of ground. Located in McMullen County, Texas. Plant will handle 2,000 MCF of sour gas per day, containing up to 900 grains of sulphur per thousand cubic feet, and dehydrate gas to 5 and 6 pounds of water per million cubic feet. Equipment list, specifications and plant layout available on request. Plant and line sold together or separate to highest bidders. Contact Jupiter Oils, Inc., P. O. Drawer 251, Alice, Texas.

NEW PUMPS FOR SALE

2 Gardner-Denver model PL-7 with elec. drive, 250 HP. Price $16,500.00.
3 Aldrich Vertical Triplex, 2¾ x 8, 123.4 GPM @ 2500 psi.
3 Byron-Jackson Cent., Hydropress 15" x 12", 4160' head.
New Silent Chain-Link Belt.
200' 1¼" x 7" $15.00 per foot.
Other sizes in stock: 1½" x 7", 10" and 16"

COOK INDUSTRIES, INC.
Merchantville, N. J.

BJ HYDRAULIC TUBING TONGS

King Rental Tools running 8 BJ Tubing Tongs. 1957 gross $53,000.00. Current month Aug. '58 had 36 jobs. Net ½-¾ of gross. Will sell tongs separate or w/bldg. Total new value $59,000.00. Will sell tongs for $32,000 or $38,000 w/lot & bldg. Shop bldg. fronts on 6 lane thruway. Guarantee all tongs to be in good running condition. Reason for selling—want ranch. Box 2372, Ph. FE 2-9644, Odessa, Texas.

NEW LINE PIPE

Prime Grade A.P.I. Spec. 5-L x 52
Electricweld, 40' DRL, Beveled
5500' 20" O.D. x .406 wall 65.01#
3250' 20" O.D. x .375 wall 78.60#
2430' 18" O.D. x .375 wall 70.60#
Moody inspection certificates available
Located: Harvey and New Iberia, La.
Very reasonably priced.

MID-STATES PIPE & SUPPLY CO.
OF LOUISIANA
Phone CHerry 2-7997 Tulsa, Oklahoma

FOR SALE EQUIPMENT

8⅝" OD—19.64# EW PE Line Pipe, 13,900 feet, 40 and 50 foot lengths. Line new. $1.55 foot at Toronto, Kansas. Box 1215, DI 3-9563, Tulsa, Oklahoma.

T-16 NATIONAL Rotary Rig, complete with 5100' 4½" Drill Pipe; Walker-Neer C-32 Three Drum Spudder, mounted on 1955 International 190 Tandem, complete with all tools; Fred E. Cooper Double Drum Spudder, mounted on tandem axle float, complete with all tools; Wilson Double Drum Well Servicing Unit, mounted on GMC tandem truck, with all tools. This equipment is all in very good condition. Call or write John R. Adams, c/o Foster Drilling Co., Inc., Box 751, Cushing, Oklahoma. Phone CA 5-0274 or CA 5-3914.

HELP WANTED

FOREIGN EMPLOYMENT. List oil companies, drilling contractors, seismograph contractors, showing where apply foreign jobs, $5.00 cash. OIML Co., Box 2603, Tulsa, Okla.

Petroleum Production Engineer

Large Independent Integrated Oil Company needs Petroleum Production Engineer with a minimum of two to three years field experience for work in water flood field development. Located in Appalachian area. Salary range from $6,000 to $7,200.

Box K-842,
The Oil and Gas Journal,
Tulsa, Oklahoma.

EQUIPMENT WANTED

A COMPLETE SET of API Master Tool Joint Gauges, 2⅜, 2⅞ and 3½ inch. Box K-850, The Oil and Gas Journal, Tulsa, Oklahoma.

ONE PORTABLE PULLING UNIT; maximum depth—1,500 ft., double drum with sand line, bailer sand pump and miscellaneous equipment for tubing and rod pulling; with equipment for bailing and swabbing. Also want No. 1 used pumping units, single cylinder gas engines, electric motors, tanks, heaters and separators. Box K-851, The Oil and Gas Journal, Tulsa, Oklahoma.

1 36L BUCYRUS-ERIE Spudder, trailer mounted, not more than 5 years old, no tools or lines, preferably diesel powered. Write—Peak Petroleum Co., 217 E. Fillmore, Colo. Spgs., Colo., or phone ME 5-2858.

HELP WANTED

PETROLEUM OR MECHANICAL ENGINEERS with drilling or production experience interested in Sales Engineering. Excellent opportunity for right men to work with highly respected, established Company. Job openings in both domestic and South American areas. Send resume to: Box K-834, The Oil and Gas Journal, Tulsa, Oklahoma.

OPPORTUNITY FOR REFINERY ACCOUNTANT

Opening for refinery accountant. We have an excellent opportunity for senior accountant to be in charge of all refinery accounting. This is an opportunity for experienced accountant who has initiative, ambition, and ability. Applicants should have refinery or similar accounting experience. All replies kept in confidence. Salary commensurate with ability and experience. Forward resume describing work history, education and salary requirement to:

MR. LEON HESS
HESS TRADING AND TRANSPORT, INC.
P. O. Box 631
Perth Amboy, N. J.

ENGINEERS - TOOLPUSHERS

Well established International Drilling Contractor will soon have positions available as Resident Managers of foreign operations for Engineers with extensive field experience in drilling and managerial ability.
Engineers with Toolpushing experience preferred, but will consider Engineers with drilling experience.
Attractive salary and benefits. Training in Domestic Company before foreign assignment.

Box K-836,
The Oil and Gas Journal,
Tulsa, Oklahoma.

OPENING FOR PROCESS SUPERINTENDENT

New refinery at Sewaren, N. J. has opening for process superintendent. Excellent opportunity for experienced individual who has ambition and ability. Applicant should have ten years refinery operating experience. Chemical engineering education preferred. All replies handled in confidence. Salary commensurate with ability and experience. Forward resume describing work history, education, and salary desired to:

MR. LEON HESS
HESS TRADING AND TRANSPORT, INC.
P. O. BOX 631
PERTH AMBOY, N. J.

HELP WANTED

OPPORTUNITY FOR REFINERY MANAGER

Unusual opportunity at our new Sewaren, New Jersey refinery for a seasoned refining executive who has had at least ten years operating and administrative experience. Must have initiative, drive, and capacity to direct all phases of complete 45,000 B/D refinery operation. Petroleum or chemical engineering background preferred. All information confidential. Salary commensurate with ability and experience. Forward resume describing education, operating experience, and salary requirement to:

MR. LEON HESS
HESS TRADING AND TRANSPORT, INC.
P. O. BOX 631
PERTH AMBOY, N. J.

MANUFACTURERS REPRESENTATIVE in Venezuela. Well established manufacturer of replacement parts for diesel, gas and steam engines, pumps, compressors, etc. requires agent in Venezuela with established following among superintendents, operating engineers, purchasing agents of refineries, gasoline plants, pipelines, municipal power plants, machine shops, cold storage plants. Exclusive territory offered. Advise territory covered and lines handled. Box K-840, The Oil and Gas Journal, Tulsa, Oklahoma.

OPENINGS FOR REFINERY-INSTRUMENT MECHANICS

Newly constructed independent oil company refinery at Sewaren, N. J. has openings for instrument mechanics. Applicants must be experienced and capable of servicing and maintaining pneumatic, mechanical, electrical and electronic equipment. Send resume to personnel manager.

HESS TRADING AND TRANSPORT, INC.
P. O. Box 631
Perth Amboy, N. J.

CHEMICAL ENGINEER WANTED

Young chemical engineer with approximately two years' refinery process operations experience for thermal engineering of heat transfer equipment. All inquiries will be held in strict confidence. Address correspondence to . . .

E. D. ANDERSON
WESTERN SUPPLY COMPANY
P. O. Box 1888 Tulsa, Okla.

Opening Available for Refinery Process Supervisor

Expanding Western Canadian Refinery and Marketing Organization requires a Refinery Process Supervisor as Assistant to the Refinery Manager. Applicants for this position should have a minimum of 8-10 years petroleum process design and refinery operating experience and have proven ability in supervisory capacities.

If you are now employed in the petroleum industry and have the qualifications and experience to rapidly advance to Refinery Superintendent our client offers a challenging and rewarding position.

Address replies in care of

Nattall & Maloney Ltd.
210 CIVIC BLOCK
EDMONTON, ALBERTA

HELP WANTED

PROCESS ENGINEER for medium-sized refinery in middle west. Chemical engineering degree and experience with modern refining processes required. Opportunity for advancement with established independent company. Pleasant family living conditions. Reply to: George Armistead and Company, 1000 Connecticut Avenue, Washington 6, D. C.

ENGINEER: Large independent oil company in Mid-Continent area with extensive pipeline department has opening for engineer with corrosion experience. Applicant must be graduate engineer with approximately five years oil field experience consisting of at least three years of specialized corrosion work. Box K-831, The Oil and Gas Journal, Tulsa, Oklahoma.

MECHANICAL ENGINEER—Minimum of 5 years experience petroleum refinery, petrochemicals plant or closely related fields. Must have working knowledge of refinery processes, equipment, utilities and preferably some maintenance background. Good opportunity to grow with a growing organization. Send complete resume and salary requirements to The Vickers Petroleum Company, Inc., Potwin, Kansas, attention Mr. F. W. Macfarline.

LAND MAN—CAPABLE WORKING UP DEALS—SECURING FARMOUTS—GOOD KNOWLEDGE GEOLOGY AND ECONOMICS—ROCKY MOUNTAIN AREA—SEND RESUME, SALARY EXPECTED AND PHONE NUMBER—INDEPENDENT OPERATOR ANSWER—

BOX K-843,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

OPENING FOR LEAD BLENDER-REFINERY

Independent oil company refinery at Sewaren, N. J. has opening for a gasoline blender. Must be experienced in refinery blending of gasoline, including tetra-ethyl lead, and additive blending. Send resume to personnel manager.

HESS TRADING AND TRANSPORT, INC.
P. O. Box 631
Perth Amboy, N. J.

OPENING FOR REFINERY SUPERVISOR PLANT PROTECTION AND SAFETY

Experienced refinery safety engineer with ability and capacity to supervise plant security and inaugurate safety program. Position at newly constructed independent oil company refinery at Sewaren, N. J. Send resume indicating experience, education, and salary requirement to personnel manager.

HESS TRADING AND TRANSPORT, INC.
P. O. Box 631
Perth Amboy, New Jersey

HELP WANTED

WANTED, Aggressive representatives for manufacturer of API oil well pumping equipment for growing company. Experienced production man preferred. Good opportunity with several Mid-Continent territories available. Box K-837, The Oil and Gas Journal, Tulsa, Oklahoma.

ASSISTANT DISTRICT FOREMAN

Supervision of high pressure gas transmission pipeline construction, maintenance and operation. Engineering background desired with three to five years experience in pipeline work, including supervisory responsibilities. Position offers excellent opportunity for advancement to higher management. Location New England. Send resume of education, experience and salary expected. Box K-846, The Oil and Gas Journal, Tulsa, Oklahoma.

ACTIVE INDEPENDENT requires geologist. Must be young and willing to work and have 2-4 years Eastern Oklahoma experience. Replies strictly confidential. Send resume and recent photo to

Box K-846, The Oil and Gas Journal, Tulsa, Oklahoma.

OPENING FOR REFINERY SHIFT FOREMAN

Newly constructed oil refinery at Sewaren, N. J. has openings for several shift foremen. Applicants must be experienced in supervising hourly employees working on refinery units and have general knowledge of processing operations and refinery equipment. All information confidential. Salary commensurate with ability and experience. Forward resume to personnel manager indicating work experience, education, and salary requirement.

HESS TRADING AND TRANSPORT, INC.
P. O. Box 631
Perth Amboy, N. J.

PETROLEUM ENGINEERS

FOREIGN AND DOMESTIC PRODUCTION & RESERVOIR

Petroleum production, development for reservoir engineering experience; to collect, analyze and evaluate data pertaining to the characteristics and performance of oil reservoirs; to study reservoirs in order to determine the most efficient production methods and secure optimum production. Also basic reservoir research concerned with evaluation of oil production reservoirs. Assignments in Saudi Arabia and New York.

Write giving full particulars regarding personal history and work experience.

RECRUITING SUPERVISOR, BOX 293
ARABIAN AMERICAN OIL COMPANY
505 PARK AVENUE,
NEW YORK 22, NEW YORK

SITUATION WANTED

COMMAND PILOT: 4,525 multi-engine hours. Rating: commercial-instrument. Most recently employed as jet test pilot for Douglas. Graduate, M.A. degree. Foreign flying experience. Howard McHenry, 1539 So. Gary, Tulsa.

CHEMICAL ENGINEER. Twelve years experience major companies in process design, project engineering, construction and operation of gas processing and cycling plants, including pipeline facilities. Supervisory experience. Familiar with gas sales and products contracts. Desire position in Texas with medium size company, independent, sales organization or contractor. Box K-853, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATION WANTED

FOREIGN ASSIGNMENT DESIRED—Over five years Petroleum Engineering Experience. Detailed resume on request. Box K-844, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: Experienced Independent desires position with small or large company. Box K-841, The Oil and Gas Journal, Tulsa, Oklahoma.

RESERVOIR ENGINEER, 31, married. Ten years of broad, active experience in production management, waterflooding, gas injection, reserve estimation, appraisals, and workovers. Desires responsible position with growing organization. Presently employed with major company. Box K-845, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST-LANDMAN, B.S. Geol., M.B.A. Mgt., Now operating successfully on own, for valid reason desires position with company looking for proven oil finder and exploration administrator. Experienced U. S. and Canada in highly responsible company positions. Box K-852, The Oil and Gas Journal, Tulsa, Oklahoma.

PHOTO-REPRODUCTION SUPERVISOR—thoroughly familiar with the needs of oil companies in photo-reproduction, (all phases), offset duplication, microfilm, microprint. Also qualify as mapping department supervisor. Complete work history on request. Box K-849, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER—seven years drilling and production experience, desires position with small company or independent, foreign or domestic. Box K-847, The Oil and Gas Journal, Tulsa, Oklahoma.

WATER-FLOOD ENGINEER: Graduate engineer, 12 years supervisory experience, field applications, management problems; water-flood, secondary recovery operations; including development, operation, evaluation, unitization, and execution of projects. Interested in increasing production for independent. Married, Age 36. Presently employed in Mid-Continent area. Box K-854, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING or Petroleum Engineer: 10 years varied domestic and foreign experience in engineering and as a toolpusher. Two degrees in engineering. Married, age 35—desire domestic or foreign employment. Presently employed. Box K-835, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION ENGINEER: 7½ years foreign experience; production, drilling, and equipment. Graduate. Age 31. Prefer domestic. Roland Reynolds, Smethport, Pa.

GEOLOGIST: Wide experience South Texas; Seismic interpretation and reworking. Geologist Major Company, Large Independent, and consultant. Consider retainer or responsible position. Box K-829, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST-GEOPHYSICIST, 30, B.A. Math, M.S. Geology, 6 years interpretative experience with major, desires position with consulting or small oil firm with exploration department. Detailed resume on request. Box K-830, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM GEOLOGIST—B.S. 28, Single. Desires position as subsurface geologist in Mid-Continent or Rocky Mountain area. 2 years experience in foreign work. Box K-833, The Oil and Gas Journal, Tulsa, Oklahoma.

STRIP LOG CABINETS

MORE LOGS ARE FILED in Kraftbilt Strip Log Cabinets than all others combined. Loaded drawers glide smoothly on roller bearings. Three drawers per section, add sections as needed. Bilt to last a lifetime! Send for Catalog 58-B. Ross-Martin Co., P. O. Box 800-A. Tulsa 1, Okla.

PRODUCTION FOR SALE

FOR LEASE—27 acres, four miles east of Electra. Five shallow wells; one water input well; averages 10 barrels per day. New equipment. Have water flood permit; just started. For immediate sale. Contact J. J. Mellinger, 510 Tacoma Ave. Tacoma, Wash., or V. L. Alvey, P. O. Box 1181, Electra, Texas.

PRODUCTION WANTED

WANTED: Oil properties, 100 to 5,000 barrels daily in Oklahoma and Kansas. Morris Sitrin, P. O. Box 1160, Tulsa, Okla.

PRINCIPALS with unlimited funds seek any-sized oil-gas production. Give details; strict confidence. Box K-774, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

640 ACRE LEASE, Independence, Kansas. Eleven wells. 1200 ft., 34 gravity, little water. 1000 bbls. monthly. Two years old. Thirty more proven locations. Ideal for syndicate. Wonderful deal. No prorations. Particulars—E. A. Mabes, 702 Commerce Bldg., Kansas City, Missouri.

FOR SALE, LEASE, OR TRADE: 420 acres, Dickens County, Texas; two parcels of 100 acres each north of Bokchito in Bryan county and 150 acres in Pushmataha county, Oklahoma. Will give lease if lessee will drill in one year or will lease for price for five years. In Oklahoma will sell or trade surface and half minerals for surface and half minerals in Woodward county. Box K-828, The Oil and Gas Journal, Tulsa, Oklahoma.

WANT IT CHECKED OR BOUGHT. Will check, buy, buy your non-resident leases, or map leases, ownership, U. S., State. Fee lands in Washington, Oregon, Idaho. Have leased in Texas, Oklahoma, Kansas, Colorado, Nebraska, Wyoming, Montana, North & South Dakota, Idaho, Utah, Nevada, Oregon, Washington. Have been up Alaska way. Mineral interest buying a specialty. E. P. "Burley" Henson, P. O. Box 235; Olympia, Washington. Phone: FLeetwood 2-0270.

WANTED—Oil & Gas Royalties for Investment. Commonwealth Trust Co. P. O. Box 350, Wilmington 99, Delaware.

FOR DRILLING DEALS in Texas, contact Ogden Oil Company, P. O. Box 464, Ph. EL 2-3332, Taylor, Texas.

ALASKA
Cook Inlet Basin, West Foreland Area: 20,000 acres. 1/8th override. $15.00 per lease acre.
Copper River Basin: 2,560 acres. 1/8th override. $1.00 per lease acre.
Kandik Area: 20,000 acres. 1/8th override. $1.00 per acre.
LLOYD E. HONSINGER,
1702 Twining Avenue, Anchorage, Alaska

FARMS AND RANCHES

1090 ACRE cattle ranch Osage County, Okla. Real nice improvements. $55,000.00. Wells Land Co., Nowata, Okla. Phone 281.

MAPS

FOR SALE—Three Regional Geological Base Maps of West Central Texas, with electric log and completion card files. Ideal basic information for development of prospects. Box K-847, The Oil and Gas Journal, Tulsa, Oklahoma.

PERSONALS

PAN AMERICAN CONSULTANTS, a newly formed partnership specializing in oil and gas development in Latin America has opened offices in the Maryland Casualty Building in New Orleans, and the Ambar Motor Building in Havana, Cuba. The partnership is composed of John F. Bricker, Management; Fernando Freyre, Legal; James R. Crow, Geological.

MONEY RAISING

FINANCIAL CONTACTS, Underwriters, Brokers, Private Finders of Capital reached. No shopping. Confidential. FREE ENTERPRISE ASSOCIATES, 817—51st St., Brooklyn, N. Y.

BUSINESS SERVICE

Delaware Corporation formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

SCOUTING

THE ALASKA OIL SCOUT—"Your personal Alaska landman." Complete research & filing service. Status Reports—Maps—Information. 1702-J Twining Avenue, Anchorage, Alaska.

BUSINESS OPPORTUNITIES

LISTED OIL COMPANY is interested in the acquisition of Independent Oil Companies or Private Production through purchase or merger. Give full details in first letter. Box K-838, The Oil and Gas Journal, Tulsa, Oklahoma.

MONEY NOW READY for your producing oil royalties large or small. All inquiries promptly answered. P. O. Box 2185, Denver, Colorado.

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Specializing in oil property acquisition, wildcatting, development, operation and disposal offers a completely integrated organization to supervise, service and manage oil properties of any size in West, North, and Central Texas. Inquiries are invited from individuals, estates, trusts, partnerships, joint ventures, etc. References furnished.

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Abilene, Texas

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Successful Wildcats

(Continued from page 157)

SOUTHWEST TEXAS

Kent County: Sun Oil Co. 1 Bilby Wallace "J," 12-98-H&TC, 1½ mi. N Clairemont. IP 87 BOPD, 16/64-in., GOR 446, 40°-gravity, TP 125 psi., Pennsylvania 6,712-26 ft. TD 6,731 ft., ground elev. 2,089 ft.

Mitchell County: Noel Pautsky 1 Airhart, 8-28-T&P, 14 mi. NW Colorado City. IPP 67.5 BOPD, 28°-gravity, GOR 300, Permian 2,588 ft. TD 3,220 ft.

Scurry County: Sunray Mid-Continent Oil Co. 1 Hobbs, 151-3-H&TC, 2 mi. NW Hermleigh. IP 178 BOPD, 20/64-in., 33°-gravity, GOR 920, TP 160 psi., Pennsylvanian 6,850-6,972 ft. TD 7,350 ft., elev. 2,377 ft.

Ward County: Edwin L. Cox et al 1 Edwards, 3-B20-PSL, 12 mi. SE Monahans, 1½ mi. NE Crawar field. IP 178 BOPD, ¼-in., 35°-gravity, GOR 739, TP 125 psi., Devonian 6,450-80 ft. TD 6,936 ft., ground elev., 2,607 ft.

ALASKA

Standard Oil of California, Kenai Peninsula wildcat. Suspended last winter. TD 12,046 ft. Important dry hole.

CALIFORNIA

Ventura County: Lester I. Bartlow 1 Bartlow-Hetman, SE SE 36-3n-18w, 52 BOPD, 29.9° gravity, perfs. 276-456 ft., TD 458 ft. (Shallower pool discovery in Simi field).

Kern County: Richfield Oil Corp. 34-9 KCL H, SE NW 9-11n-21w, 2,250 BOPD, 1½-in. choke, 29.8° gravity, 0.1% cut, perfs. 11,452-11,560 ft., TD 11,970 ft. (New field discovery 21 miles south of Bakersfield near Wheeler Ridge field).

Shell Oil Co. 84-23 KCL, SE NE 23-30s-25e, 89 BOPD, 9.2% cut, 20/64-in. choke, perfs. 9,455-83 ft. and 9,490-9,545 ft., TD 9,912 ft. (New pool discovery in northwest Ten Section field).

WYOMING

Fremont County: Pan American 34-A S. A. Tribal, 19-2n-1w. IP 51 BOPD, 5 BW, 17°, Nugget 1,154-76 ft., 1,186-1,299 ft., 1,300-17 ft. TD 1,352 ft. New pay at Winkelman Dome field.

Campbell County: Davis Oil Co. 1 Government, C NW NW 22 50n-76w. IP 456 BOPD, 36°, Parkman 6,680-6,700 ft. TD 7,125 ft. Extension to Barker Creek field.

Fremont County: Sinclair Oil & Gas Co. 1 Federal-Travis, 13-34n-91w. IP 3,714 M.c.f.d. of gas, Shannon 2,784-2,837 ft., 2,885-2,925 ft. TD 2,980 ft. New gas discovery in Castle Garden field.

Hot Springs County: Ohio Oil Co. 1 Unit, 18-46n-98w. IP 344 BOPD, 34 BWPD, 22°, Madison 4,550-80 ft., 4,439-57 ft., 4,486-92 ft. TD 4,987 ft. New pay in Grass Creek field.

Natrona County: True Oil Co. 1 Weisel, C NW NE 5 31n-84w. IP 488 BOPD, 40°, Muddy 6,234-47 ft. TD 6,490 ft. Discovery of Poison Spring Creek field.

Sublette County: Belfer Natural Gas Co. and Carter Oil Co. 5 E. LaBarge Unit, C NW NW NE 28-27n-112w. IP 4,700 M.c.f.d of gas, second Frontier 7,130-46 ft., 7,155-82 ft., 7,210-33 ft., 7,243-72 ft., 7,422-58 ft. TD 7,980 ft.

Sweetwater County: Ohio and Carter 1 Government, NW SE SE 12-20n-95w. IP 7,500 M.c.f.d. of gas, 15 BOPD, 2 BWPD, Almond 9,594-9,624 ft., 9,690-9,725 ft., 9,744-56 ft. TD 10,474 ft. Washakie basin discovery.

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SOLVE ANOTHER STORAGE PROBLEM IN CENTRAL QUEBEC, CANADA

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5. The bolted joints are water tight and air tight.
6. The tanks are designed to be quickly and easily dismantled, shipped to a new construction site and re-erected.

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